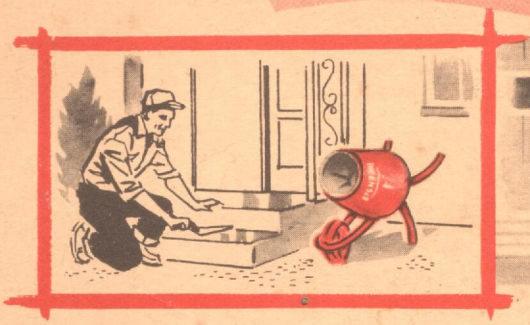
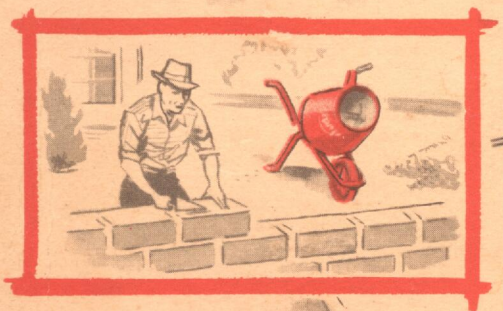
How to do

CEMENT & CONCRETE JOBS around the home





ANOTHER FRIENDLY **LIGHTBURN** SERVICE FOR HANDYMEN

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FOREWORD

Concrete is one of the strongest and most durable of all building materials.

It has a wide variety of applications and is used extensively on huge projects such as the Snowy River Scheme, bridge and dam building, and in the multi-storey buildings which are springing up in capital cities throughout Australia.

Its use, in the large constructional type of job, is one demanding specialised knowledge and skills, and this book does not presume to instruct the specialist and skilled tradesman in his work.

This book is written for those people who want to do concreting work around home and are not quite certain how best to go about it. It is written in simple language so that it will be clearly understood by the layman who may become confused with technical terms and methods.

It will take the reader — step by step — through the essentials necessary to produce a completely satisfactory finished job—a job one can be proud of.

The reader will do well to remember that because concrete is so strong and durable, mistakes made in it can be difficult to dispose of. Concrete cannot be burnt like timber, and there is no fun in breaking it up or burying it to cover up mistakes that have been made.

That is one reason why careful planning, which plays such an important part in the larger construction jobs, is desirable and well worthwhile for any concreting work to be carried out around home. Folk who have recently moved into a new home would be well advised to draw up a plan showing where all footpaths are to be laid, where the garage or car-port is to be built, and the driveway leading to it. Any ornamental features like garden pools or fish ponds—or a barbecue that adds so much to the pleasure of outdoor living—should be included in the plan.

Of course, it is not necessary to prepare an elaborate plan, or have one drawn up by an architect. But a carefully considered plan will form the basis for an attractive garden layout, and not something that will look disjointed because it was built in bits and pieces without thinking far enough ahead.

And, for those people living in established homes with footpaths and drives already laid, any additional features should be planned to match the home and the garden.

This book has been written by LIGHTBURN & CO. LIMITED—the Concrete Mixer People of Australia—in keeping with the spirit of friendly service which LIGHTBURNS are anxious to extend to anyone who has cement or concreting work to do.

LIGHTBURN & CO. LIMITED are the largest manufacturers of Concrete Mixers in the Southern Hemisphere. Their Mixers are used as standard equipment by all Government Departments throughout Australia, they are used by the Australian Army, and have been supplied to Trade Schools in South East Asia under the Colombo Plan.

LIGHTBURNS export their Mixers to more than 35 overseas countries. They make a complete range of Mixers including trailer, barrow and stand types . . . engine or motor driven and hand Mixers . . . 7 models from 1 to 3½ cubic feet capacity . . . giving 28 different combinations for a prospective purchaser to choose from.

Right now, LIGHTBURN hand Mixers are being used by native Phillipine labourers in an extensive road building programme being carried out in that country.

In addition, LIGHTBURNS conduct a Hire Mixer Service in the capital city of each State—another friendly LIGHTBURN service for handymen and building tradesmen.

This book does not set out to cover all of the concreting jobs that can be done around the home, but it does cover those which the average person is most likely to be interested in.

If information is required on other work which is not covered herein, contact LIGHTBURN & CO. LIMITED at —

Cnr. Grey and Peel Streets, South Brisbane	Phone 4 1361
132 Stanmore Road, Stanmore, N.S.W.	Phone 56 6351
404 Elizabeth Street, Melbourne	Phone 34 4618
Morphett Road, Camden, S.A.	Phone 9 4193
396 Murray Street, Perth	Phone 23 1351

requesting information on the particular work to be done. LIGHTBURNS will be pleased to provide any details they have available, and give any information and assistance required in connection with the purchasing or hiring of a LIGHTBURN Mixer.

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TOOLS REQUIRED

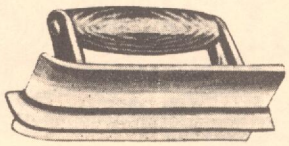
From the handyman's point of view, there is one really important feature about concrete in addition to its strength and durability, and that is that very few special tools are required to do concreting jobs around the home. Furthermore, there are quite a few items that a handyman can make up himself.

When selecting tools, it is wise to remember the old proverb which says "A poor workman always blames his tools." Good workmen select good tools. The handyman should never be influenced in favour of a cheap article of indifferent quality and appearance because it may only be used for a relatively short period. Such items are bound to lose their appeal when they are put into use. Quite often they are harder to handle, the job takes longer, and inferior work sometimes results.

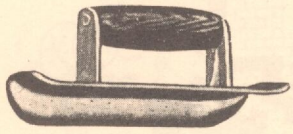
Most folk will have a selection of garden tools which can be used for concreting work. These would include such things as a RAKE, which can be used to spread the concrete after it is poured ; a SPADE or SHOVEL, which can be used in mixing the concrete and placing it ; a PICKAXE, to loosen up the ground where shallow excavations may be necessary ; and a WHEELBARROW, which can be used to move the concrete from the mixing site to wherever it is being laid.

A fairly heavy HAMMER is a tool which can be found in practically every home. This can be used for driving in levelling pegs , nailing up form work, and chipping operations where these are necessary. Other carpentering tools which can be used in concreting work are a heavy RULE or STEEL TAPE for measuring off distances and a SPIRIT LEVEL for obtaining levels.

Among the special tools required is a 12″ STEEL FLOAT to get a glossy smooth surface on concrete or cement work, a WOODEN FLOAT of the same size to produce an even non-slippery surface, and an 8″ bricklayer's pointed TROWEL if it is intended to do any brick or stone laying.



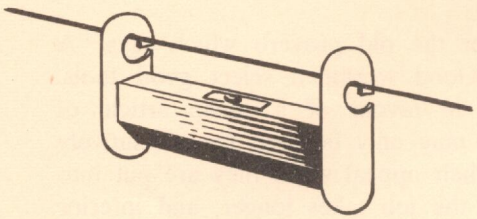
This GROOVING TOOL gives a professional finish to joints in concrete work.



An EDGING TOOL forms the smooth, rounded edges on paths, driveways and terraces.

A GROOVING TOOL is an essential to obtain the special shaped grooves seen between joints in concrete paths, floors and driveways, and an EDGING TOOL is required to form the smooth rounded edges on concrete work that give the professional look.

A LINE CORD and PINS are normally used to maintain straight edges and level courses when laying brick or stone work and are invaluable in setting levels over long distances. In the latter application, a LINE LEVEL which clips over the line cord, is required as a level indicator. A satisfactory substitute for the tradesman's line cord is a length of heavy fishing line, while two stout nails—4″ to 5″ long—are quite good substitutes for the line pins.

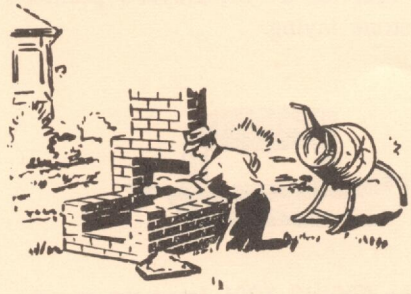


A LINE LEVEL is invaluable when setting levels over long distances.

In levelling, particularly over relatively short distances, a STRAIGHT EDGE is required. This can be made up from any suitable timber around home. Its length will vary depending on the particular job, but a straight edge about 8′ long—made from timber 3″ to 4″ wide and 1″ thick—is quite a handy size. The top and bottom edges should be planed perfectly straight and parallel with each other as the name implies.

A STRIKER BOARD or SCREED can be made up from scrap timber also. The striker board is used to level off the surface of the concrete with the form boards and its length will vary depending on the particular job. It should be made up from timber 3″ to 4″ wide by 1″ thick and the top and bottom edge should be planed perfectly straight. This planed edge is the one which is used to level off the concrete with the tops of the form boards.

One thing that is really necessary is a CONCRETE MIXER. It will save a lot of time and hard work and will produce a much stronger, longer-lasting mixture than could be obtained by shovel mixing.



A LIGHTBURN 1¼ c.ft. MIXER.
Hand operated, stand type.

A LIGHTBURN 1 c.ft. MIXER.
Hand operated, barrow type.

The choice of a mixer depends, amongst other things, on the amount of work to be done and on the price it is desired to pay. Naturally, hand operated mixers are generally the lowest in price. They are available in two types, the stand type and the barrow type. They range from between 1 and 2 cubic foot capacity and the prices vary between £10 and £35 each.

For those who do not own a wheelbarrow, the barrow type mixers are a good proposition. They are available in capacities from 1 to 1½ cubic feet and are priced from £15 to £25.

But of course, a power driven mixer is best if there is a fair bit of concreting to do. They cost a little more, but they are faster, and much easier to operate too. They sell at somewhere near £50 for a model powered by an electric motor.

This LIGHTBURN 1¾ c.ft. MIXER can be operated by hand, or powered with electric motor or petrol engine.

Whichever type of mixer is chosen, be sure to select a reputable brand and one for which spare parts can be readily obtained if they should ever be needed.

And remember, any type of mixer—regardless of price— will be better than that back-breaking shovel method.

HOW TO MIX GOOD CONCRETE

Concrete is a mixture of cement and other materials, known as " aggregates," which sets in a hard mass when water is added. However, care is necessary in making concrete that will be strong, weatherproof, and will retain a good surface.

The cement and water would, of course, form a paste if used without the addition of " aggregates," but hardened cement paste would be a very expensive building material. Because of this, and for other reasons as well, the bulk of the cement and water paste is increased by the addition of cheaper materials.

The strength and durability of concrete depends on the following factors :—

1. The quality and properties of the materials used.
2. The proportion of cement in the finished concrete.
3. The strength of the cement paste.
4. Thorough efficient mixing.
5. Thorough consolidation of the concrete.
6. Curing.

The quality and properties of the materials used.

Cement cannot set until moisture is added to it, when a chemical action takes place. This causes the particles to bind together in a solid mass or adhere to other substances. Cement must be kept dry, for even the moisture in the atmosphere is sufficient to start the setting action. When cement has set so hard that it cannot be crumbled in the fingers, it should not be used, because the hard lumps have no cementing properties and merely act as stones or other aggregates.

The cement principally used is Portland Cement which is normally grey in colour, but it is also made in white and a variety of colours by the addition of mineral oxides. There are also rapid hardening varieties of Portland Cement which harden more quickly and are stronger at early stages than the normal Portland Cement.

There is no difference in the method of using any of the various types of Portland Cements but, because of their high cost, the coloured cements are generally used for facing or topping courses only.

Sand is the fine aggregate normally used in mixing concrete and can be one of the most variable factors involved. There are an infinite number of dif-

ferent kinds of sand but, generally speaking, they can be divided into two groups. Sharp sands with coarse grains—which may include pebbles or chippings up to ¼"—are normally used when mixing concrete for heavy pathways or floors, while the fine grained sands may be preferred in mixing cement mortars where a very smooth-textured mortar is required.

Only clean or washed sand should be used, for it should be free from earth or clay and from vegetable or organic matter.

Metal screenings or gravel are most commonly used as coarse aggregate, although the crushings of any hard stone are quite satisfactory. Soft flaky shale or rotten stone is too weak in itself to support heavy wear and tear, and if used as coarse aggregate, it may even cause complete cracking or crumbling. Broken brick is a useful aggregate for work of minor importance, but it should never be used in reinforced concrete. Broken brick must be free from adhering plaster or lime mortar.

The size of the coarse aggregate depends on the work on which it is to be used. For work around home however, the coarse aggregate should pass through a sieve with a ¾" mesh and, like the sand, it should be free from earth or clay and from vegetable or organic matter.

The average domestic water supply provides water which is quite satisfactory for mixing concrete and a good general rule to follow is that water to be used in concrete should be drinkable. Many harmful impurities, such as common salt and organic matter, can be introduced by using a brackish or dirty water supply.

The proportion of cement in the finished concrete.

As long as the materials, water content and the mixing processes are the same, the strength of the concrete depends on the quality and the strength of the cement paste it contains. However, an excessive proportion of cement will be harmful because it will cause cracks due to shrinkage and contraction. For ordinary work, concrete in the proportions of one part cement, two parts sand or fine aggregate and four parts metal screenings or coarse aggregate, is suitable. However, the proportions of cement and other materials used can vary depending upon particular requirements, and the various proportions and type of work for which they are most suited are covered in the section " Estimating quantities of materials."

The strength of the cement paste.

There seems to be a natural tendency for most people to use too much water in concrete. The quantity of water used is important, because it affects the strength and durability of the finished job.

As more water is added to a given quantity of cement, it produces a weaker cement paste and weakens the concrete in which it is used.

An excess of water leaves voids in the concrete when it dries out—with consequent loss of strength. The aim should be to use the least quantity of water that will make the concrete sufficiently workable to enable it to be placed in position without honeycombing.

However, it must be remembered that a certain amount of water is required to properly hydrate the cement.

The quantity of water to be used in mixtures of various proportions will be found in the section "Estimating quantities of materials."

Thorough efficient mixing.

Unless the ingredients of concrete are thoroughly mixed together, all of the trouble taken in grading the aggregates, proportioning and deciding on the water content, can be wasted. The object to aim at is a mixture in which the aggregates of different size are evenly distributed throughout, in which the cement and water are evenly distributed so that the cement paste is of uniform strength, and in which each piece of stone and particle of sand is coated with cement paste.

Machine mixing is more efficient, faster and a lot easier than shovel mixing—except for the smallest quantities of concrete—and a concrete mixer should be used wherever possible.

The water should be placed in the mixer bowl first and then the cement added. While the mixer is turning, the water and cement are mixing up into a paste. The sand is added next and finally, the metal screenings. As each shovelful is loaded into the mixer bowl, the sand and metal screenings are being thoroughly and evenly covered with the cement paste. This thoroughly mixed, even coating of cement paste over every particle of the sand and metal screenings gives the strongest, longest-lasting concrete. Thorough mixing of each batch of concrete is speeded up when the water is placed in the mixer bowl first, and the batch can be discharged almost immediately after the last shovelful of metal screenings or coarse aggregate has been added.

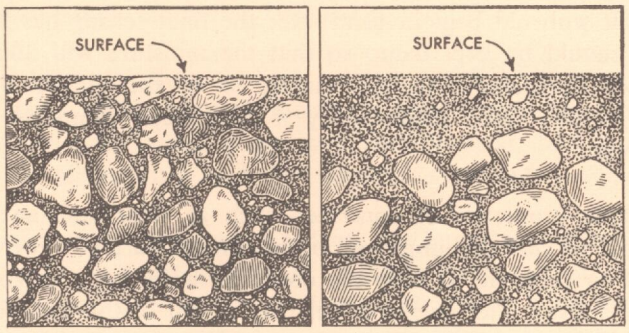
If all of the ingredients are mixed dry in the mixer, the batch should be mixed for 1½ minutes after adding the water. There is no advantage in continuing the mixing for longer than this.

Thorough consolidation of the concrete.

As the concrete is poured and placed, it must be consolidated so that it is as dense as it is possible to get it. This eliminates voids which are a source of weakness.

In the case of stiff mixes, it may be necessary to use a heavy rammer to consolidate the concrete, but the average mixture can be consolidated by tamping it down with the blade of a shovel, or the edge of a striker board or screed.

Tamping must be continued until air bubbles cease to escape and a film of moisture appears on the surface of the concrete. At this stage, tamping should be discontinued. Further tamping only brings more water and fine material to the top, producing layers of a rich mixture between layers of leaner mixtures, thus separating the materials that so much trouble has been taken to proportion and mix thoroughly.



Cross sections cut through concrete walks clearly show the difference between well trowelled concrete (left) and improperly trowelled concrete (right). The layer of weak material at the right is the result of over trowelling, which brings an excess of the fine material to the surface of the walk.

Excessive trowelling of freshly placed concrete must be avoided. Trowelling brings neat cement and water to the surface and this will set as a skin on the body of the concrete. It will however, be a weak skin which will chip and flake off if it is on a floor or driveway subject to traffic, or crack if it is on a surface subjected to changes of temperature.

Excessive trowelling of wet concrete is probably the most common cause of " dusty " floors and unsightly hair cracks or surface " crazing."

Curing.

Cement sets and hardens only in the presence of moisture and, when the moisture dries out, the setting and hardening processes stop.

When mixed with water, cement forms a paste which remains plastic for a short time, but as the re-actions with the water proceed, the mix begins to stiffen or " set." The time for the initial " set " in concrete is variable, but it usually takes place between a half and one and a half hours from the time the concrete is poured and placed. The common causes of variation are the water content in the mix, the type of cement used, and weather conditions.

After the initial " set " has taken place, the final setting and hardening continues with the presence of moisture.

If concrete is to harden properly, it should remain moist under favourable temperatures until it has gained the greater part of its ultimate strength. For all normal purposes, the hardening period is usually regarded as occupying seven days with ordinary Portland Cement, and four days with rapid hardening cement. During this period, the concrete should be kept damp and must be protected against drying winds, hot sunshine and extreme cold.

In this country, concrete which is laid in the summertime may require protection by covering it with old bags or sand after the final setting has taken place. These coverings should be kept damp so that the moisture will allow the hardening process to continue. In the winter, or in the milder weather, the concrete should harden quite satisfactorily if it is kept damp by spraying it with a garden hose.

All of the desirable properties of concrete—such as wear resistance, strength, water-tightness and so on—are improved by additional curing. For this reason, it is a good idea to continue to keep the concrete moist for a period of longer than seven days. Even after curing of this nature, all of the desirable qualities of the concrete are improved by occasional watering.

ANOTHER FRIENDLY **LIGHTBURN** SERVICE FOR HANDYMEN

HOW TO MIX MORTAR

There are three kinds of mortar in general use.

The first and oldest of these is lime mortar, which consists of hydrated lime, sand and water. This type of mortar is slow-setting and relatively soft, is useful where strength is not a primary consideration, and is satisfactory for rough brick or stone work and for scratch or rendering coats in plastering.

Where strength, quick-setting and hardness are important factors, cement mortar is generally used. This consists of a mixture of cement, sand and water, and is normally used as a topping or surface course on base courses of concrete in floors, driveways and paths—or on work where a water-tight surface is reguired.

Fortunately, it is possible to combine the properties of lime mortar and cement mortar in what is known as "compo." This is a lime and cement mortar consisting of sand, lime and cement in varying proportions to suit particular types of work, and water. In this mixture, the lime provides the plasticity and makes the mortar easy to use, while the cement provides the added strength, quicker setting, and hardening properties.

In building, lime and cement mortar—or " compo "—is generally used as the bonding material between bricks, stones or cement blocks, and for scratch or rendering coats in plastering. Where brick or stonework is in contact with flame or is exposed to heat—as in the case of fireplaces, barbecues, incinerators and the like—fireclay, because of its heat resisting properties, can be used in the mortar instead of lime. In such cases, the quantity of lime that would normally be used is replaced with an equal quantity of fireclay.

Only hydrated lime should be used in mixing mortar. In the building trade, some builders buy rock lime or quick lime and slake—or hydrate—it with water. The resultant mixture of hydrated lime and water is known as lime putty, and this is used with sand—or sand and cement—in mixing the mortar. But to simplify and speed up the mixing of mortar, many builders are using hydrated lime—which is in the form of a fine, dry powder—and marketed under a number of brand names. The hydrated lime is usually packed in paper bags—similar to cement—holding approximately 1¼ cubic feet and weighing somewhere around 50 lbs. each. For work around home, it is recommended that a reputable brand of hydrated lime be used. Where only small quantities are required, most merchants would be prepared to supply less than full bag lots.

The sand used for mortar—like that used for concrete—should be clean, sharp, well-graded and free from loam, clay, salt, vegetable matter and other impurities. Coarse grained sands are best for mortars that are going to be used for brick or stone laying, topping or surface courses on paths or floors, or for scratch or rendering coats in plastering. However, fine grained sands may be preferred in mixing mortars where a very smooth texture is required.

In most mortars, grey Portland Cement is generally used, but in some applications, white Portland Cement may be preferred. Cement—and lime too—must be kept dry.

Colour can be introduced into all three types of mortars by the addition—and thorough mixing—of metallic oxide pigments with the lime or cement. The method of doing this is the same as that outlined in the section dealing with the colouring of cement.

Clean, fresh water should be used for mixing mortar. The average domestic water supply provides water that is quite satisfactory, but a good general rule to follow is that the water used in mixing mortar should be drinkable.

It is important that all of the ingredients in mortar be thoroughly mixed together to maintain a constancy of the desirable properties—such as strength, plasticity, quick-setting and hardness—being aimed for. For this reason, machine mixing—which is much more efficient, faster and easier than shovel mixing—is recommended and generally preferred. Except for the smallest quantity of mortar, a concrete mixer should be used.

The following table gives a practical guide to various mixtures and the proportions of materials required.

Class of Work	Proportion of mix (in volume)			Yield of Mixture (in cubic feet) per cubic foot of lime and cement	Qty. of water required (in gallons) per cubic foot of lime and cement
	Sand	Lime	Cement		
Mortar for brick or stonework in walls, or for scratch or rendering coats in plastering.	3	1	–	2.80	4.9
	3	1	1/10	2.90	5.4
	4	1	1/10	3.70	6.1
OPTIONAL MIXES					
Mortar for scratch or rendering coats in plastering.	9	2	1	2.80	4.9
Mortar for brick or stone work for foundations or work below plate line.	6	1	1	2.80	4.9
Mortar for brick or stone work in chimney breasts.	9	2	1	2.80	4.9

Class of Work	Proportion of mix (in volume)			Yield of Mixture (in cubic feet) per cubic foot of lime and cement	Qty. of water required (in gallons) per cubic foot of lime and cement
	Sand	Lime	Cement		
Mortar for wall tiling in bathroom, kitchen or laundry.	6	1	2	2.10	4.2
High strength grout mixture.	1	–	1	1.40	3.5
Watertight plaster coats for tanks, cellars, walls, dairy floors etc. Mortar for structural brickwork.	2	–	1	2.10	4.2
Surfact rendering or topping course for two course work.	2½	–	1	2.45	4.5
Mortar for wall plaster, rough-casting and stucco.	3	–	1	2.80	4.9
Mortar for brick or stonework.	4	–	1	3.60	5.6
Sand-cement mixture for building blocks and bricks.	5	–	1	4.30	6.2
Mortar for brick or stonework.	6	–	1	5.60	7.0

In mixing any of these mortars for the general run of work around home, the water should be placed in the mixer bowl first, then either the lime or cement—or both—is added. While the mixer is turning, the water and the lime or cement are mixing up into a paste or slurry. The sand is added last of all, and, as each shovelful is loaded into the mixer bowl, each particle of sand is being thoroughly and evenly coated with the lime or cement paste. This thoroughly mixed, even coating of lime or cement paste over every particle of sand gives the strongest, most easily worked mortar. The mixer should be allowed to turn the mortar over for about one minute from the time the last shovelful of sand is added.

In the building trade, there are several variations introduced to this method of mixing to obtain greater plasticity in the mortar. In the first of these, the sand and hydrated lime are mixed dry until the whole is a uniform colour, and the water is then added and thoroughly incorporated by further mixing. This mortar is left to stand for a period of not less than 24 hours before use. Where lime and cement mortar is required, the cement proportion of the mix is added to the lime mortar that has been standing for at least 24 hours, and the whole batch is thoroughly mixed again prior to delivery to the bricklayer or plasterer.

The other method of mixing mortar is to mix the lime with water to form a putty, which is allowed to stand for at least 24 hours. This lime putty is then gauged with sand in accurate proportions to the dry lime used, the cement is added if a lime and cement mortar is required, and the whole batch thoroughly mixed.

Although these last two methods of mixing mortar are successfully employed in the building trade where large quantities are generally required, the first method involves a great deal less work and is quite satisfactory for most work around the home.

Mortars containing cement must not be used after one hour has elapsed from the time the cement is added, so never mix up more than can be handled—and finished off—in this time. And remember that porous bases and backgrounds will absorb quite a deal of the moisture from the mortar, and cause it to stiffen before it may be possible to work it properly. To guard against this, always give bricks or stones a good wetting down before setting them in mortar, and give walls a thorough damping before applying a scratch or rendering coat of mortar to them.

ESTIMATING QUANTITIES OF MATERIALS

Although many folk have a reasonably good idea how to go about concreting jobs around their homes, quite a few people do not know how to estimate the quantities of materials required for a particular job.

There is nothing more annoying than to be part way through a job and then be held up because of a shortage of material. Of course, this position is aggravated when the work is being done over the weekend, and further supplies are not immediately available.

On the other hand, heaps of excess sand and metal screenings, and bags of cement that can deteriorate if they get wet, are too expensive to waste. Keeping them until they may be needed again is just as big a nuisance.

In obtaining a fairly close estimate of the quantities of materials required, the first essential is to work out the cubic content of concrete needed for a particular job. For instance, in a path 30′ long by 3′ wide by 3″ thick, the cubic content would be established by multiplying the length by the width by the thickness as follows :—

$$\frac{30}{1} \times \frac{3}{1} \times \frac{1}{4} = 22\frac{1}{2} \text{ cubic feet.}$$

The next factor to consider is the " yield," which is the quantity of concrete produced from 1 bag or 1 cubic foot of cement.

In this sense, the term " yield " is used to indicate the volume of concrete produced in terms of the quantity of combined aggregates used. Naturally, the " yield " will vary depending on the proportions of aggregate used.

For instance, in a mixture of 1 cubic foot or 1 bag of cement, 2 cubic feet of sand and 4 cubic feet of metal screenings, the " yield "—or the quantity of concrete produced—would be 4.5 cubic feet. The " yield " from mixtures of different proportions is shown in the table further on.

Once the " yield " has been established, the quantity of cement required can be estimated by dividing the " yield " into the cubic content of the particular job.

As an example, in the path referred to above, 22½ cubic feet of concrete would be required. If a 4 : 2 : 1 mix was used with a " yield " of 4.5 cubic feet of concrete to each bag of cement, the quantity of cement needed for the job is arrived at as follows :—

$$\frac{45}{2} \times \frac{2}{9} = 5 \text{ cubic feet or } 5 \text{ bags of cement.}$$

When the quantity of cement required has been established, it is easy to estimate the quantities of the other aggregates needed. Once again, this will depend on the proportions of the aggregates used in the mix.

With a 4 : 2 : 1 mix, 2 cubic feet of sand will be needed for each cubic foot or each bag of cement, so a job requiring 5 cubic feet or 5 bags of cement will require 10 cubic feet of sand.

Similarly, in a 4 : 2 : 1 mix, 4 cubic feet of metal screenings will be required for each cubic foot or each bag of cement, so a job requiring 5 bags or 5 cubic feet of cement will need 20 cubic feet of metal screenings.

Sand and metal screenings are sometimes sold by weight and sometimes by volume, but, as a general rule, 1 cubic foot of either weighs approximately 100 lbs., or near enough to 1 cwt.

The following table gives a practical guide to various mixtures and the proportions of materials required, the "yield" of each mixture per cubic foot or 1 bag of cement, and the quantity of water required in each mixture per cubic foot or 1 bag of cement.

Class of Work	Proportion of mix (in volume)			Yield of mixture (in cubic feet) per cubic foot or 1 bag of cement	Qty. of water required (in gallons) per cubic foot or 1 bag of cement
	Metal Screenings	Sand	Cement		
Heavy-duty floor surfacings for factories and dairies. Very thin slabs and slender columns where heavily reinforced.	2	1	1	2.70	4
High structural strength concrete for thin reinforced walls, slender reinforced columns, fence posts, heavy-duty floors.	3	1½	1	3.55	4.7
High strength concrete for heavily trafficked roads and heavy-duty factory or mill floors.	3½	2	1	4.20	5.2
Commonly adopted mixture for reinforced concrete beams and floor slabs, roads, footpaths etc., silos, etc.	4	2	1	4.50	5.4
For general structural purposes.	4	2½	1	4.90	5.6

Class of Work	Proportion of mix (in volume)			Yield of mixture (in cubic feet) per cubic foot or 1 bag of cement	Qty. of water required (in gallons) per cubic foot or 1 bag of cement
	Metal Screenings	Sand	Cement		
For strong foundations, lean mix roads.	5	2½	1	5.50	6.1
Foundations for roads, machinery, buildings, etc., and for concrete in mass walls.	6	3	1	6.60	6.9

From the above table, it will be seen that for most mixtures, an approximate method of establishing the "yield" is by adding the proportion of cement to the proportion of metal screenings.

In the case of a 4 : 2½ : 1 mix, add the cement proportion (1) to the metal screenings proportion (4) and obtain an approximate "yield" of five (5) cubic feet of concrete to each cubic foot or each bag of cement. The table gives the "yield" of this particular mix as being 4.9 cubic feet of concrete to each cubic foot of cement.

Another useful method of calculating the amount of water required for each cubic foot or each bag of cement in most mixtures, is by adding the proportion of sand to the proportion of metal screenings.

In the case of a 3 : 1½ : 1 mix, add the sand proportion (1½) to the metal screenings proportion (3) and obtain the approximate amount of water required as being 4½ gallons to each cubic foot of cement. The table gives the amount of water required for this particular mix as being 4.7 gallons to each bag of cement.

Although these two methods of calculating will not apply in the case of every mix, they will serve as a useful guide if the table cannot be referred to on the spot.

When ordering materials, it is wise to order slightly more than the quantity estimates show, in order to avoid the possibility of running out of material before the job is finished.

LEVELLING

In the introduction to this book, mention was made of the advisability of careful planning. This applies particularly to the setting of levels—and especially the levels of any paths, driveways, or terraces where satisfactory drainage becomes an important factor.

In this type of work, it is important to make sure that levels are set to provide satisfactory drainage away from the foundations of a house, garage, or any similar building.

This is reasonably easy where the work is being carried out on a fairly flat location, but is a little more difficult perhaps where homes have been built on sloping or uneven sites. In the latter case, it may be necessary to terrace the area around the buildings in order to provide satisfactory drainage away from the foundations.

In built up areas, storm water is mostly drained away along the street water tables, and this is an ideal method of disposing of surplus roof and pathway drainage from private homes. Wherever the house foundation is above street level, all of the paths and driveways, terraces, and garden surfaces should be inclined towards the street.

But houses may be situated on the side of a hill, or even in a hollow below the level of the roadway. In such cases, the owner has certain obligations towards his neighbours. He should plan his levels to provide drainage towards the street or road, or plan levels so that surplus roof and pathway drainage will run into the garden. Every effort should be made to avoid flooding neighbouring properties as far as possible.

A big advantage will be gained by preparing an overall levelling plan before starting any improvements.

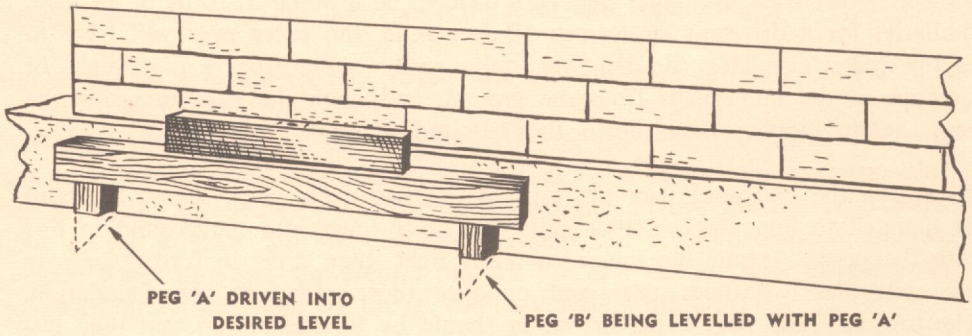
The fundamentals involved in establishing levels remain the same regardless whether levels are being set on flat or uneven ground. Obviously, it is impossible to provide a detailed procedure that would suit every eventuality. However, most home sites are reasonably flat, the foundations of buildings on them are normally above street level, and the setting of levels will mainly be required in connection with the laying of paths, driveways, or terraces.

So, for the purpose of illustrating the procedure, let us assume that it is desired to set levels for a path, driveway, or terrace on a fairly level site, and right alongside foundations that are higher than street level.

One thing that will be necessary is a quantity of wooden levelling pegs that can be made up from scrap timber—preferably hardwood—1½″ to 2″ square. They should be between 6″ and 8″ long, with one end sawn off square and the other end tapered or wedge shaped so that it can be driven easily into the ground.

The first step is to drive one of these pegs into the ground right alongside one end of the foundation, so that the top of the peg is an inch or two below the top of the foundation. This will provide a high point as close as possible to the house foundation so that drainage can then be obtained away from it.

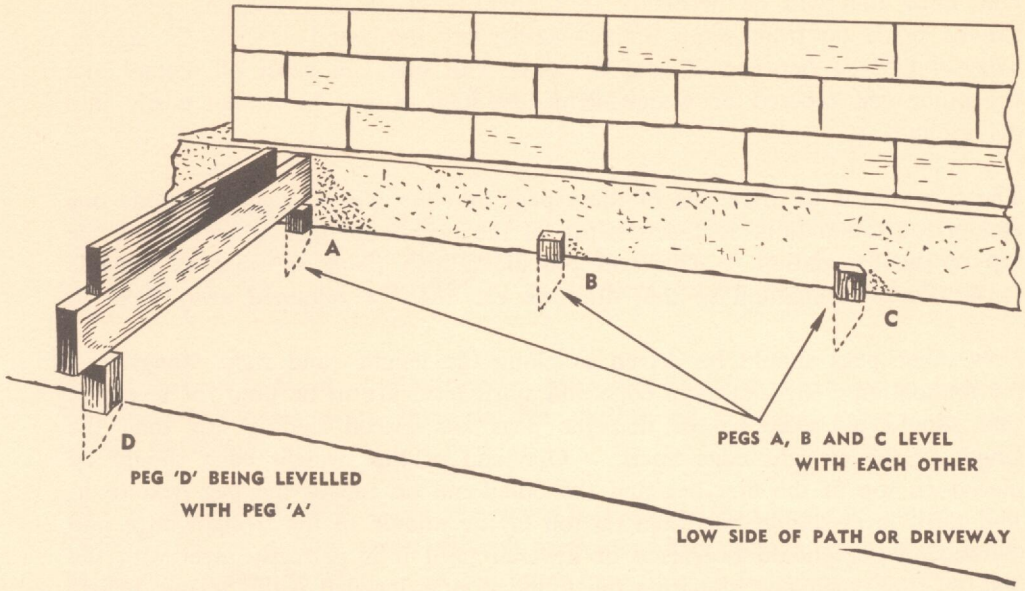
Now other pegs should be driven in along the length—and right alongside—the foundation. If a straight edge and spirit level are to be used for levelling, care should be taken to see that the pegs are spaced slightly less than the length of the straight edge apart. One end of the straight edge should be placed on top of the first peg and the other end on top of the peg next to it. The spirit level should be rested on top of the middle of the straight edge and the second peg should be raised or lowered until it is perfectly level with the first. Then each peg alongside the foundation is levelled with the one before it in exactly the same fashion until all pegs are level with each other.



Spirit level and straight edge being used to level pegs alongside a foundation.

For satisfactory drainage, paths, driveways, or terraces should have a fall of 1″ for every 10 feet in length away from the highest point, so the next step is to obtain a lower level for the other side.

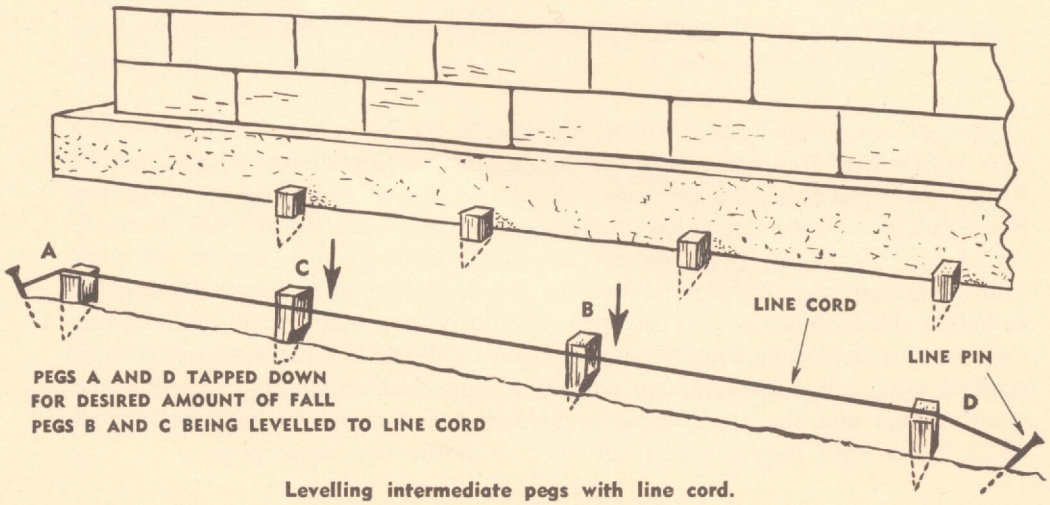
This is done by driving pegs in opposite the first and last pegs already levelled alongside the foundation. These pegs should be the width of the path, driveway, or terrace away from the foundation. The two outside pegs are now levelled with the corresponding pegs alongside the foundation by using the straight edge and the spirit level as before, and moving the two outer pegs up or down until they are perfectly level with the two inner pegs.



Levelling the first peg for low side of work. Peg is tapped down later to give desired amount of fall.

The outer pegs have to be given a fall equal to 1″ in 10 feet, so, if the path is to be 3 feet wide, the outer pegs will have to be lowered 3/10ths of an inch. Similarly, for a driveway or terrace 10 feet wide, the outer pegs will have to be lowered 1″. This can be done quite easily by measuring the height of the tops of the outer pegs from the ground, and, with the rule alongside the pegs, gently tapping them down the required amount.

Then, run the line cord over the tops of the two outer pegs, secure the cord by tieing it to line pins or stout nails and drive these into the ground in line with the pegs. Draw the line cord really tight, then drive in further pegs in line with the two outer pegs and opposite those alongside the foundation. The tops of these pegs being driven in should be levelled up so that they just touch the line cord.



Levelling intermediate pegs with line cord.

Now the pegs are set at the correct levels for both sides of the path, driveway, or terrace, with enough fall away from the foundation to provide satisfactory drainage.

Although the steps outlined provide for a fall across the width of the path, driveway, or terrace, the same principle can be applied to give the fall along the length too.

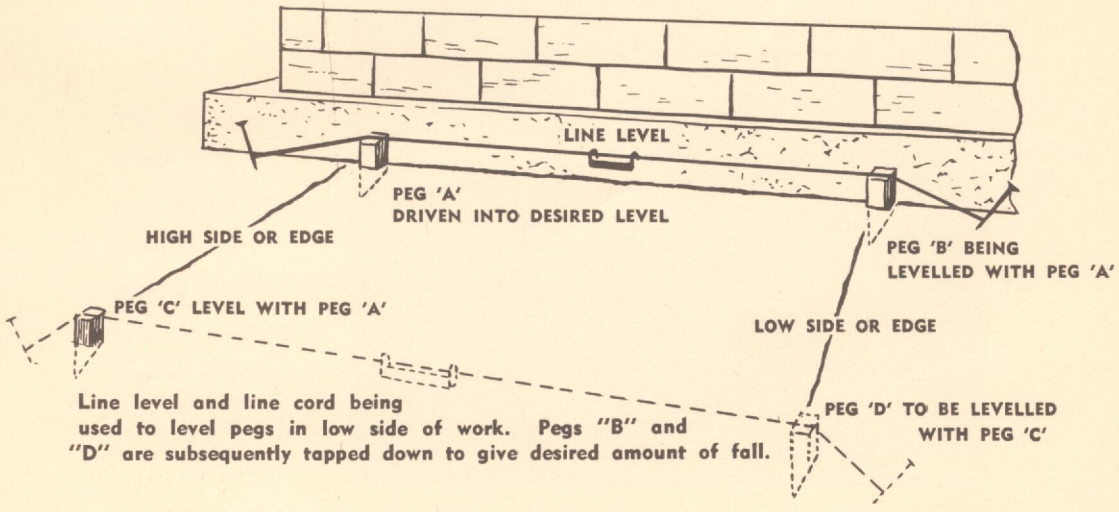
The objective is always to get the end pegs levelled first in the highest side or edge of the path, driveway, or terrace. Where a considerable distance separates the end pegs in this high side or edge, it will be much quicker to use a line level—which clips on to the line cord—instead of using the spirit level and straight edge.

Start off by establishing a level for the highest side or edge of the path, driveway, or terrace. This level may be fixed in relation to the house or garage foundations, the street footpath, or a previously laid path in the garden. But in any case, drive in a peg to the desired level.

The next step is to drive the other end peg in, then run the line cord over the tops of both pegs. Draw the line cord really tight and secure it with the line pins or stout nails as before. Clip the line level on the cord midway between the two pegs, then raise or lower the second peg until the line level shows that both pegs are both perfectly level with each other.

But to get an accurate reading, make sure the line cord is really tight.

Now drive in a peg at the lowest side or edge of the path, driveway, or terrace and run the line cord over the top of this and the top of the corresponding peg previously levelled on the higher side or edge. Draw the line cord really tight, secure it, then clip the line level on the cord midway between the two pegs. Raise or lower the second peg for the low side or edge of the path, driveway, or terrace until its top is perfectly level with the first.



Line level and line cord being used to level pegs in low side of work. Pegs "B" and "D" are subsequently tapped down to give desired amount of fall.

Then tap the second peg down to give the required amount of fall, holding the rule alongside the peg as it is tapped down, and allowing 1/10th of an inch fall for every foot length along the side or edge of the path, driveway, or terrace.

Repeat this procedure to fix the level for the other end peg on the low side or edge. Check to see that the end pegs in the low side or edge are level with each other.

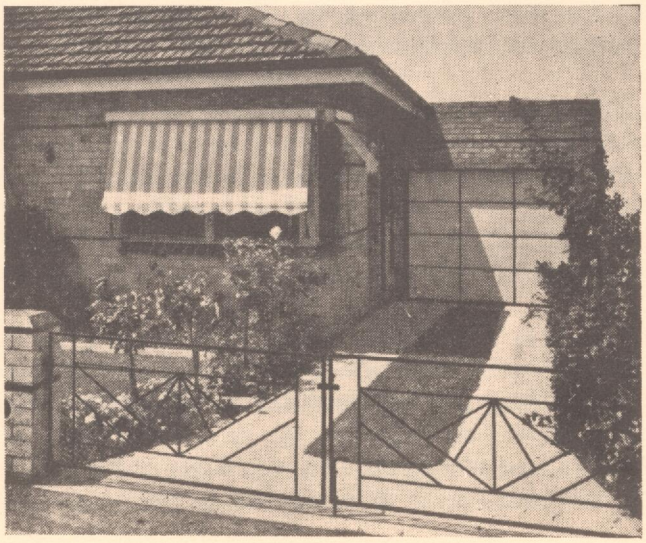
All that remains now is to drive intermediate pegs in between the four pegs which have been set to give correct levels. Stretch the line cord tight over the corresponding pegs in each side or end, draw the line cord really tight and secure it, then drive the intermediate pegs into the ground so that their tops just touch the line cord.

If the intermediate pegs are driven in at distances no more than three or four feet apart, they can be used to secure the form boards which will have to be erected before the concrete can be poured and placed. As the form boards will have to be secured to the inside of the pegs, it is advisable to keep the pegs an inch or so—or the thickness of the form boards—outside the proposed edges of the path, driveway, or terrace.

CONCRETE PATHS AND DRIVES

Many of the minor things of life have a real importance. This is particularly true of the footpaths, driveways and floors upon which the duties of everyday life are performed. However fine the home may be, it is never completely attractive unless the paths, drives and terraces around it are carefully and securely made.

The appearance of this attractive home is enhanced by well laid concrete paths and driveways.



This simple garden layout with concrete paths and driveway gives a pleasing appearance that's easy to maintain.

Concrete footpaths and driveways—whether in the street or garden—are smooth, durable, clean, and unaffected by extreme climatic conditions. The first cost of such construction is reasonable and subsequent maintenance costs are low. Construction is simple and well within the capacity of the average person. More often than not, the beginner's introduction to concreting work is brought about by the need to provide satisfactory footpaths and drives around the home.

It is important to have an overall plan before starting on the actual construction work. A plan helps in getting things into the right perspective and reserving space for the various features around a home in the most suitable positions.

When preparing an overall plan, particular attention should be paid to the following important points :—

1. The ultimate extent of concrete construction—including paths, drives, terraces, outbuildings, dividing walls, barbecues and possibly ornamental pools and the like. If these things are planned before any work is started, it will ensure that paths and driveways are placed in proper relationship to future buildings or garden layout.

2. Relative levels. Reference should be made to the section dealing with levelling for a general explanation on setting levels so that paths and drives finish up slightly lower than foundations, shed, or garage floors. Then storm water will run in the right direction—away from the buildings.

3. Consider which jobs are most needful and establish priorities for them. It may not always be wise to lay footpaths and drives in a front garden, then find that these prevent a heavily laden vehicle from gaining access to the back garden. Under such circumstances, any concreting work carried out in the back garden will involve the long haulage of materials by wheelbarrow.

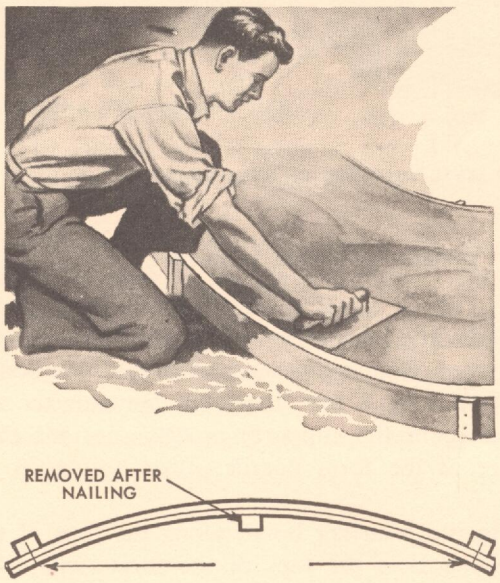
The principles which underlie the construction of concrete paths and driveways apply also to floors and terraces, or any large areas which it may be desired to cover with a hard, smooth and durable surface.

In laying a concrete path or drive, the first thing to do is to mark out the area to be paved.

The next step is to set levels by driving pegs in along the edges and sides of the area to be paved, and obtaining levels which will provide satisfactory drainage by following the steps outlined in the section dealing with levelling. Remember to drive these pegs into the ground the width of the form boards outside the lines representing the sides and edges of the path or driveway. This will enable the form boards to be secured to the inside of the levelling pegs.

In order to keep the work within bounds, wooden forms are laid to mould the path or driveway. The width of the timber used for the forms for a concrete path or driveway should be equal to the depth of concrete in the finished job. For instance, if the path is to be 3″ thick, use timber 3″ wide for the forms—a driveway 4″ thick would require form boards 4″ wide—and so on.

The timber used for the form boards must be thick enough to hold the weight of the wet concrete without bulging or buckling. Timber 1″ to 1½″ thick is quite satisfactory for the usual run of work around home.



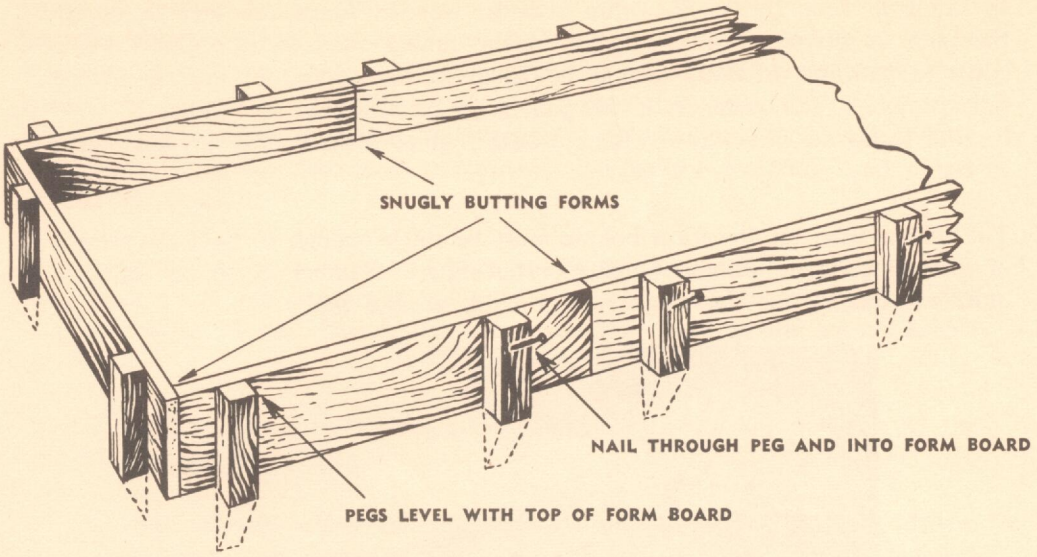
Details of curved formwork.

Of course, should part of the path or driveway be curved, the curves in the forms can be made by using strips of thin wood or sheet metal. Care should be taken to see that sufficient pegs or stakes are provided to prevent the curved form from being forced out of shape by the weight of the wet concrete, and the tamping that will be necessary to consolidate it.

In forming up, the form boards are set on edge along the inside of the levelling pegs. The top edges of the form boards are levelled with the tops of the levelling pegs and secured in this position by lightly nailing through the peg and into the form. Nailing through the peg and into the form board will make it easy to remove the forms without damaging the edges of the work after the concrete has set.

If the ground is uneven, it will probably be necessary to dig out the earth from underneath some of the form boards to get them perfectly level with the pegs.

As each form board is levelled and secured to the levelling pegs, make sure that each board butts up snugly against the next so that no gaps are left through which the wet concrete can escape.



Details of straight, continuous formwork.

Make sure that the form boards are adequately supported by pegs. There should be two pegs about 6″ away from either end of each form board, with intermediate pegs—no more than 3 or 4 feet apart—in between the two end pegs. If it is necessary to drive in the supporting pegs, see that their tops are slightly below the top edge of the form boards.

Later on, it will be necessary to run a striker board along the tops of the form boards, and pegs which are higher than the tops of the forms will only be in the way.

After all of the form boards have been secured like this, it will be possible to see where the surface of the ground is high or low in relation to the bottom of the forms. Level off the high spots with a spade or shovel, and fill in the low spots to bring them up reasonably level with the bottom of the form boards.

It is best to use metal screenings, sand or cinders for filling—particularly if the ground is inclined to be clayey. When filling in the low spots, always thoroughly compact the filling by tamping it down firmly with a rammer, or the end of a 4″ x 4″ fence post.

At this stage, the form work is complete if it is intended to lay the concrete in one continuous strip. But, because concrete sets fairly quickly—between a half and one hour normally—only a certain amount of work can be done between the mixing of each batch. It is therefore necessary to consider the dimensions of the area to be paved, and decide whether it is advisable to lay the concrete in one continuous strip, or divide it up into sections. Obviously, laying the concrete in one continuous strip will minimise the amount of form

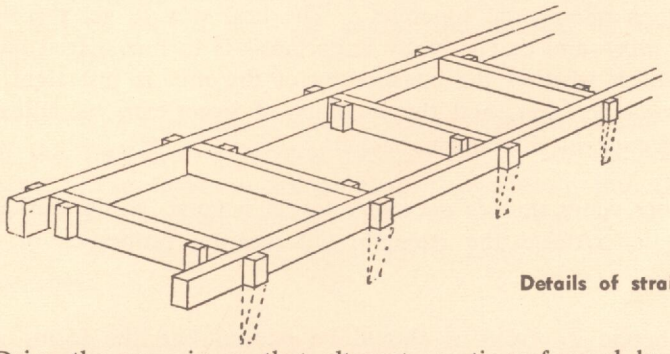
work required, but where a sizeable area is to be paved, the services of more than one man will be necessary to place and surface the concrete before the initial set takes place.

In most cases—and particularly where the work is being carried out single-handed—it is best to divide the area up into sections or bays.

This enables the concrete in each section to be placed and finished off independently from the rest, and this method is most popular where the work is being carried out a little at a time—perhaps at weekends or a few hours each evening after work.

Start off by dividing the length of the area to be paved into equal sections between 3 and 4 feet in length. For example, a path 24 feet long and 3 feet wide could be divided into 8 sections each 3 feet square, while a drive 36 feet long could be divided into 9 sections each 4 feet long. With wide areas, the width is divided into sections like this as well.

Using a pencil—or piece of chalk—and a rule, mark off the lengths of the sections on the top edge of the form boards. Then, cut division spacers from the same size timber used for the forms to fit in between the form boards at these marks. Drive pegs into the ground to secure these spacers in exactly the same way as for the form boards, keeping the tops of the pegs slightly below the tops of the forms. Two pegs—6″ away from the end of each spacer—should be sufficient if the sections are being kept to between 3 and 4 feet in length or width.



Details of straight, sectioned formwork.

Drive the pegs in so that alternate sections formed by the spacers have pegs in them and the other sections are kept clear of pegs, then level the tops of the spacers with the tops of the form boards. Lightly nail the spacers to the supporting pegs to secure them, nailing through the peg and into the spacer for easy removal.

The sections or bays clear of pegs are now ready for pouring the concrete and finishing it off. When this has been done and the concrete has set and hardened, the spacers can be removed to leave the other sections of the job ready for pouring and finishing. However, if the form work has been completed and left standing for a day or two before starting to mix and pour the concrete, it is a good idea to check it to see that the levels are still correct.

Before pouring the concrete into the forms, the area to be paved should be lightly hosed to overcome the risk of a dry base absorbing too much moisture from the concrete.

The next step is to mix up the concrete and this is probably the most important part of any concreting job. All of the work covered so far will be practically a waste of time if the concrete isn't thoroughly mixed and strong enough to stand up to years of wear. Separate sections dealing with the method of estimating the quantities of materials required, and the mixing of concrete, should be referred to.

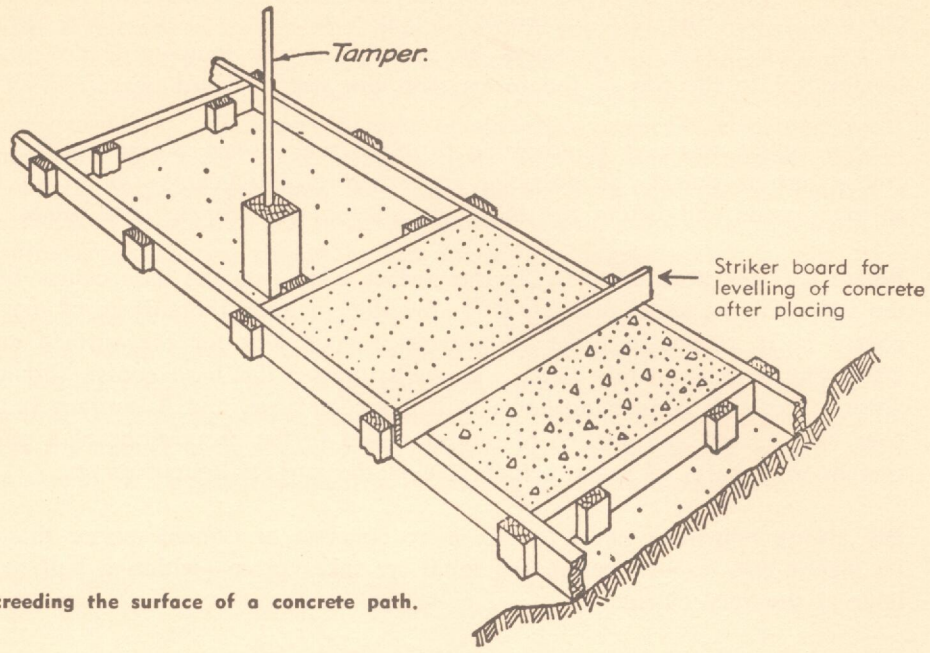
Before starting to mix the concrete, position the mixer near the heaps of sand and metal screenings, so that these can be shovelled straight into the mixer bowl. A large shallow box or tray makes a good container for the cement. Place this near the mixer and empty a couple of bags of cement into it—it is a lot easier than shovelling the cement straight out of the bag. Generally speaking, six ordinary shovels full of sand, metal or cement—but not heaped up or under filled shovels—equal about 1 cubic foot. This will give a basis for the number of shovels full of each aggregate required to fill the bowl of the mixer, for most mixers have a rated capacity which is expressed in cubic feet.

Have a drum of water handy and keep the garden hose in it to provide a ready supply of water once mixing begins. A dipper, or an empty one gallon paint tin, can be used to measure the water for each batch.

As sand is often wet when delivered, it is necessary to make allowance for the water content in it when mixing the concrete. The best way to get the right amount of water in a mix—and that is really important—is to mix a trial batch first. This will establish whether the consistency of the mix is just right, or whether it is too dry or too wet, and the quantity of water can be adjusted to get the right consistency in subsequent batches.

But don't add any more water than is necessary to get a good, easily workable mix. Too much water reduces the strength and wearing properties of the concrete.

As each batch of concrete is mixed, it should be poured into the forms and spread out evenly with a rake or shovel. For single course work, the concrete should be spread out so that it is slightly higher than the tops of the form boards, then consolidated by tamping it down, and finally levelled off with a striker board or screed. The bottom edge of the striker board can be used with a light ramming action to give the final consolidation of the concrete, then the striker board is drawn along the tops of the forms with a side to side or sawing action to level the concrete off with the top of the form boards.



Screeding the surface of a concrete path.

In two course work, a base course of concrete is laid to within half an inch of the depth of the finished job, and a surface course of sand and cement mortar is laid on top of the base course and finished off level with the top of the form boards.

In levelling the base course of concrete to within half an inch from the tops of the forms, it is a good idea to cut square shoulders out of the bottom edge of the striker board so that it goes down into the forms half an inch. Then the shoulders can be rested on the tops of the forms and the striker board used as previously described to level off the base course at the desired thickness.

The base course should be moved back from the form boards with a pointed bricklayer's trowel or steel float to form a " V " shaped groove at least ½" deep. This groove will provide a space free from metal screenings. When this space is filled in with the surface course, there will be no metal screenings at the edge of the work to impede the edging tool when it is used to finish off the surface course later on.

The surface or topping course usually consists of 2½ parts of sand to 1 of cement, although this can be varied satisfactorily by using 3 parts of sand to 1 part of cement. The amount of water to be used and the method of mixing is covered in the section " How to mix mortar," but don't make the surface course any wetter than is necessary to give an easily workable mix.

The surface course should be placed on top of the base course and spread out evenly with the rake or shovel so that it is slightly higher than the tops of the form boards. It should be consolidated by tamping it down, then levelled off to the top of the forms with the striker board or screed.

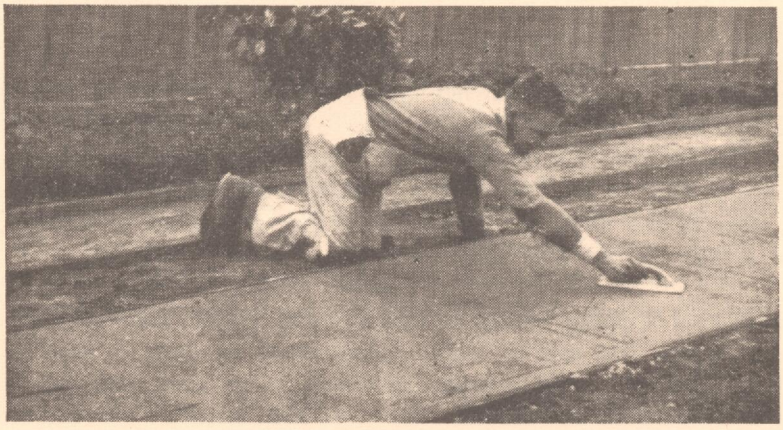
In two course work, it is advisable to place the surface course on the base course just as quickly as possible, and wherever practicable, within an hour at the outside and before the initial set of the base course takes place.

Where it is not practicable to lay the surface course on the base course before the latter has set and hardened, it is advisable to leave the surface of the base course fairly rough, in order to provide a good key for the surface course when this is subsequently laid. In such a case, the base course should be given a thorough dampening down with a garden hose, and its surface brushed over with a very thin coating of mortar mixed in the proportions of 1 part of cement to 2 parts of sand, before placing the surface course on it.

But always remember never to mix more concrete or cement mortar than can be placed and levelled before the inital set takes place—within a half to one hour at the very outside.

As soon as all surface moisture has disappeared from the topping or surface course, it is ready for finishing off. The time it takes for surface moisture to disappear varies, depending on such things as weather conditions and the amount of water in the mix. But under normal conditions, the surface course should be ready for finishing off between a half to one hour after it has been placed and levelled off. Generally speaking, the surface course should be ready for finishing off when it has a consistency similar to damp earth—and not too damp either.

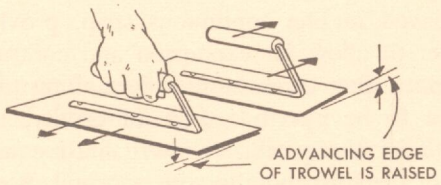
When finishing off a path or driveway, remember that a slightly rough finish is best. A wooden float produces an ideal surface for paths and driveways. A steel float will give a much smoother finish which is apt to be too slippery for safety, particularly when it is wet.



Finishing the surface of a concrete path with a wooden float.

So start off by laying the wooden float flat on the surface or topping course, then, using a circular or " figure 8 " motion, lightly rub the surface to get an even finish. Fill in any small holes in the surface with the surplus material rubbed off and, above all—keep the float flat ! Be careful to avoid excessive floating or trowelling. Excessive floating or trowelling may cause the surface to crumble and can result in " crazing "—those hair-like surface cracks often seen in smooth-surfaced porcelain sinks and basins. If the surface course shows a tendency to stick to the float, or the pressure of the float brings water to the surface, the floating should be left for a little longer.

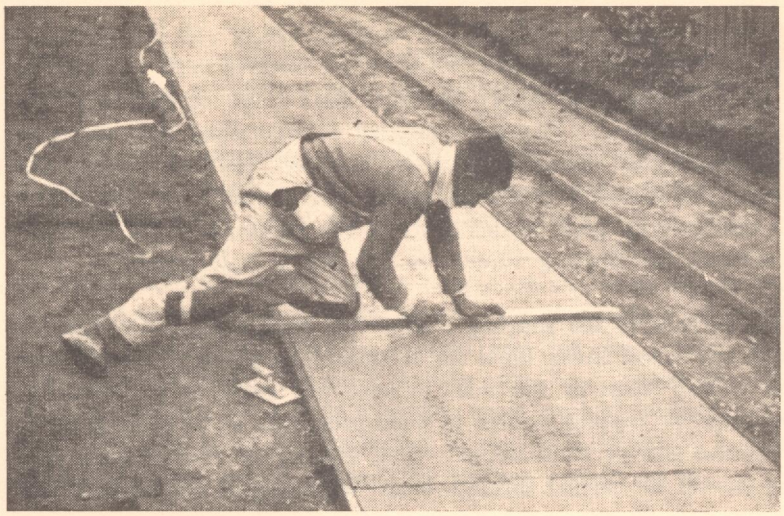
When the surface of the topping course has been evened off with the wooden float, and any small holes filled in, it should be given the final floating. In this, the leading edge of the float is kept just clear of the surface, the float is drawn over the topping course in wide arcs, and lifted away from the surface smartly at the end of each stroke. The floating of each section of a path or driveway should be carried through from beginning to end without intermission.



In the final floating, the leading edge of the float or trowel should be slightly raised.

The same steps apply in finishing off single course work. However, because some of the larger aggregate used may be at the surface of the work, it may be necessary to tamp the larger aggregate down underneath the surface in order to obtain an even finish with the wooden float. In such cases, avoid excessive tamping. This has a tendency to bring the fine material and water to the surface, with a possible loss of strength.

The next, and almost the last step, is to groove and edge the path to give it a real professional look. Run the grooving tool squarely—nose down—along the inside edge of the division spacers for each section of the path or driveway. Don't put too much weight on the grooving tool—it is better to make three or four lighter strokes than one heavy one which may finish up lower than the surrounding surface. Then repeat the same procedure with the edging tool, running it squarely—nose down again—along the inside edges of the side forms for each section.



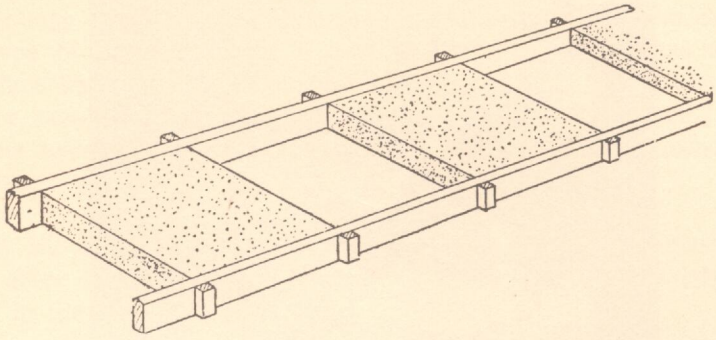
Grooving a concrete path.

If the area is being paved in one continuous strip, provision will have to be made for joints in order to allow for expansion and contraction. These joints should be spaced no more than three or four feet along the length—and across the width—of the area to be paved. For uniformity, it is best to measure the length and breadth of the work, divide it into equal spaces, and mark these on the top edge of the form boards with a pencil or piece of chalk. The base course of concrete—in both one or two course construction—should be cut across at these marks. A thin bladed axe or tomahawk or the end of a pointed bricklayer's trowel can be used to cut through the work. One longitudinal edge of a piece of 2″ by 2″ or 3″ by 2″ timber should be forced into the cut to form a " V " shaped groove which should be deep enough to eliminate the possibility of the grooving tool running into any of the metal screenings which will be present in the base course of concrete. The joints produced in this manner can be finished off with the grooving tool and the edges of the area rounded off with the edging tool as previously described.

After the whole area—or each individual section—has been finished off like this, the base course and the surface course must be prevented from drying out too quickly. As soon as it is possible to do so without damaging the surface, cover the whole area or each section with wet bags or sand, and keep the covering damp by spraying it with the garden hose. Although this covering of the surface may not be absolutely necessary in cool or damp weather, it is desirable to cover the work when the weather is warm and the surface may be exposed to hot drying winds. In any case, covering the surface in any weather can be one way of preventing surface damage, particularly where small children or household pets are liable to walk over the surface before it is properly hardened.

The paving should be kept damp for three or four days at the least—and up to seven days if possible—for good curing of concrete is vital for maximum

strength and long life. Obviously, this dampening and curing process will need more attention in warm weather than in cool.



A concrete path being laid in sections.

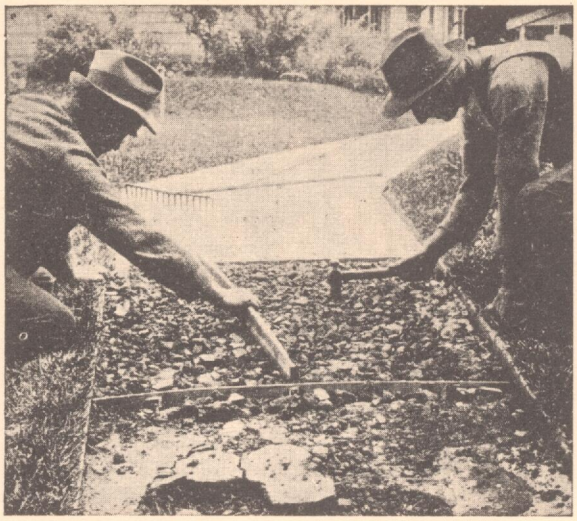
If the area has been paved in one continuous strip, the form boards can be removed about 24 hours after finishing the surface off. In the case of work which has been laid in sections, the division spacers can be removed about 24 hours after finishing off, and the remaining sections can then be poured and finished. Always place a thin strip of wood or steel—about $\frac{1}{8}$″ or $\frac{1}{4}$″ thick and as wide as the depth of the path or driveway—right across the ends of the finished sections before pouring the sections in between. This provides a joint between each section that prevents cracking due to expansion and contraction, but don't forget to remove this jointing strip before finishing off and grooving the remaining sections.

Another way of laying paths or driveways is by the "cement penetration" method.

In this method, if a concrete mixer is not available, the heavy work of mixing concrete by hand is avoided. The cement penetration method is also useful in making a new path from an old concrete or asphalt path. In the latter case, care must be taken to see that no live tar or bitumen remains in the old asphalt, otherwise it will affect the concrete.

In the "cement penetration" method, it is necessary to establish levels and erect form work in exactly the same way as that described for laying a path or driveway in one continuous length, or in sections or bays.

The coarse aggregate—whether it be broken asphalt or concrete, stone or gravel—should be about 1″ in size. It should be spread out in an even layer in the path forms to the full depth required, then consolidated by rolling or hand ramming.



Breaking up an old path for re-laying by the "cement penetration" method.

A grout mixture of 1 part cement to 2½ parts fine sand is mixed with sufficient water to give a fluid consistency. This usually requires approximately 7 gallons of water to each bag of cement. This grout is then poured over the compacted aggregate until all the spaces between the aggregate are filled and a thin layer of grout remains on the surface. The success of the method depends on the thorough compaction of the aggregate and the complete penetration of the grout.

Pouring the grout.

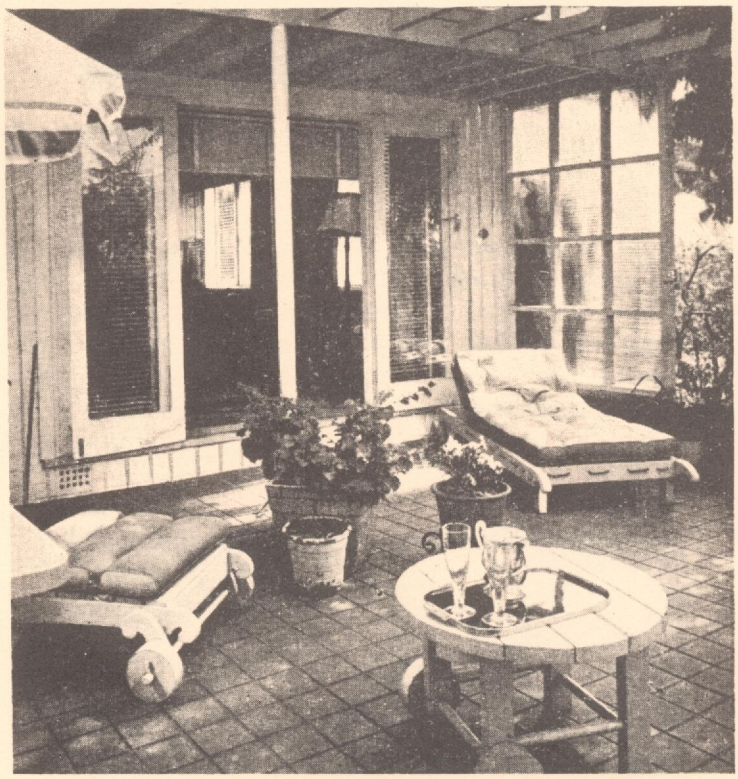
After grouting, the path or driveway may be rolled or rammed again to aid the penetration of the grout, and displace any pockets of air which may have been trapped in the aggregate. During this process, water will rise to the surface and may be allowed to float away.

The work may be brought to a smooth finish by using a wooden float, but in this type of construction, it is best to lay a topping course to obtain a good surface finish. The method of mixing, placing and finishing a topping course for paths or driveways laid by the " cement penetration " method is exactly the same as for a path or driveway laid in one continuous length, or in sections.

The work should be jointed in exactly the same way as previously described for the other types of paths or driveways, and requires exactly the same attention in the curing process.

CRAZY PAVING

There are a number of ways of laying crazy paving. Although most ways involve more work than the laying of an ordinary concrete path or terrace, many folk think that the extra work is well worthwhile. At the very least, it must be agreed that the finished job looks "different," and, in some homes, matches the house and the garden a lot better than an ordinary concrete path or terrace.



An attractive outdoor living area paved with square slabs.

Probably the most popular way of laying crazy paving is by setting irregular pieces of flat stone or slate into a concrete base, then filling in between the pieces with cement mortar. As a variation to this, the flat stones or pieces of slate may be bedded in a fairly thick layer of dry sand instead of being set in a concrete base. But of course it is not absolutely necessary to use flat pieces of stone or slate. Precast concrete slabs and irregular shaped flags can be made up and used instead of stone or slate, and with the concrete slabs particularly, a path or terrace can be laid in a wide variety of patterns.

Another way of obtaining a crazy effect in paths or terraces is by laying the concrete as described in the previous section, and grooving the surface in a crazy pattern. The grooves may then be filled in with a coloured cement mortar to provide contrast.

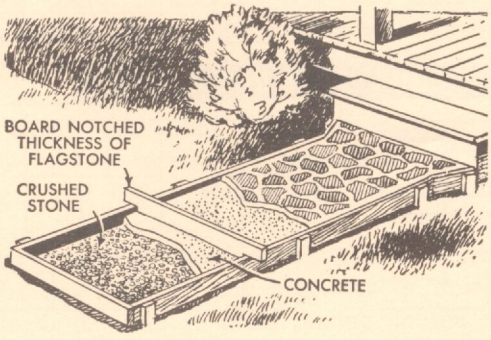
Laying irregular shaped flags for a crazy path.

A fourth method—and probably the least popular of all—is to lay the concrete in the usual manner, but using slightly more water in the mix than is normal. After the concrete has been laid for about one hour, it should be cut to pattern with a trowel, and broken into the patterned pieces when it has hardened. The space in between the patterned pieces is then filled in with a cement mortar.

Grooving the surface of a concrete path before it has hardendened to obtain a "crazy" effect.

But in every method, the initial steps of setting levels and erecting form work are identical with those which have to be carried out for laying an ordinary concrete path or terrace.

If the concrete slabs, stone, or slate are being set into a concrete base, the concrete for the base course will need to be levelled off slightly less than the thickness of the slabs or slate below the top of the form boards. For example, if the slabs or slate are 1″ thick, the concrete for the base course should be levelled off ¾″ below the top of the forms.

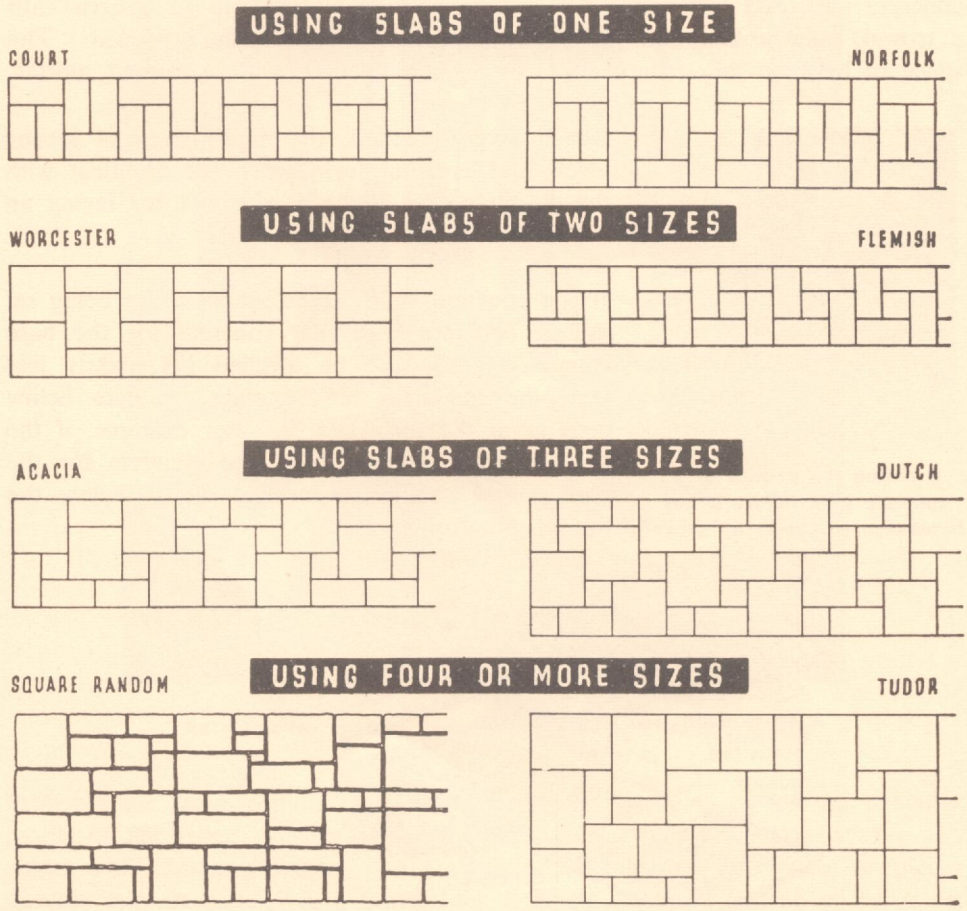


Sectional view of crazy path under construction.

When a reasonable amount of concrete has been poured and levelled to within the required depth from the top of the forms like this—and most certainly before the concrete begins to set and harden—the slabs or slate should be bedded into it.

Give the stones or slate a good dampening before laying them, place them on the wet concrete to obtain the crazy effect, then tap them down into the concrete until they are almost level with the top of the form boards. It is a good idea to run a straight edge or striker board over the tops of the forms and use it to give the slabs or slate the final tapping down to get them perfectly level.

This operation of pouring and levelling the base course—then placing, bedding and finally levelling the slate or slabs—is to be repeated until the whole area is covered.



Eight patterns that can be produced with regular shaped slabs.

But remember to provide contraction joints every 4 to 6 feet along the length and across the width of the area being paved. Unless this is done, expansion and contraction when the paving has set and hardened may cause unsightly cracking, and this needs to be avoided at all costs. The joints can be made by cutting right through the concrete base with the blade of a pointed trowel or tomahawk, and the position of the joints marked on the outside face or top edge of the form boards so that it will be easy to see where they are later on.

If dry sand is used as a base instead of concrete, it should be levelled off in the forms in exactly the same manner. But before bedding the slabs or slate into the sand, give both a thorough dampening down. After the slabs or slate have been set in the sand to give a crazy effect, they should be tapped down and finally levelled with the tops of the forms in exactly the same manner as if they were being set in a concrete base.

All that remains now is to fill in between the stones or slate with cement mortar and finish off the joints.

For this, use a mixture of 2½ parts of sand to 1 part of cement, with about 4 gallons of water to each bag of cement. The mortar should be thoroughly mixed until it has a consistency similar to that of damp earth, but be careful not to make it too wet.

If the base course of concrete or sand, and the slate or slabs set in it have dried out, give both a good dampening down before filling in the spaces with the cement mortar. Use a pointed trowel to place the mortar in the spaces and use the blade of the trowel—or a flat piece of narrow timber—to force the mortar down into every crevice. It is best to slightly overfill the spaces, then after the mortar is well compacted, the excess mortar can be trowelled off so that the top of the mortar filling is level with the surface of the slabs or slate.

Finish off the contraction joints by running a grooving tool along the mortar. If a base course of concrete has been used, there won't be any difficulty in deciding where to joint the mortar with the grooving tool if the position of the contraction joints have been marked on the outside face or top of the form boards as suggested earlier. To get nicely rounded edges on the paving, run an edging tool along the inside faces of the form boards as well, But leave the cement mortar for between a half to one hour after placing it and levelling it off before starting the grooving and edging.

With crazy paving, many people prefer to have coloured cement in between the slabs or slate, and the best way of doing this is to add metallic oxide pigments to the cement when mixing up the mortar filling. The method of colouring cement is covered in a separate section.

After the paving has been finished off and the cement mortar filling has set and hardened, it should be kept damp for at least a week. Always remember that proper curing is essential in producing good concrete work that will give many years of service.

REPAIRING CONCRETE PATHS

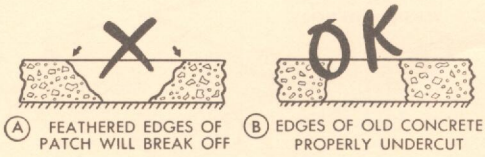
Nothing mars the appearance of an attractive home and garden more than concrete paths which have cracked or crumbled, or in which unsightly holes have developed.

In many cases, these faults develop because of incorrect procedures that were adopted at the time of construction, and it is wise to make every effort to establish the cause of the fault before making a start on repairs. The cause of faults in concrete paths can be many and varied. Trouble can occur because the foundation is unsuitable, or the filling of low spots has not been thoroughly consolidated. Unsuitable ingredients, incorrect proportioning of mixtures, aggregates which are not thoroughly mixed together, excessive trowelling or floating, and lack of proper attention in the curing process are also among some of the most common causes of faults.

Unless the cause of the trouble can be established, it is possible that the mistake may be repeated in the repairs, and nothing is more disheartening than to carry out unsuccessful repairs of any kind.

Now in some cases, depending of course on the extent of repairs necessary, it may be a much better proposition in the long run to re-lay the complete path or sections of it. Should this be necessary, the re-laying of the path—or individual sections—by the " cement penetration " method is well worth considering.

But where the repairs that are required are confined to relatively small areas, the first step is to chip away all of the old, crumbly concrete. Use a hammer and cold chisel and cut right back and down to good solid concrete. Patches that are to be repaired should be cut down at least an inch deep, even if the crumbly parts are shallower than this. If the patches are crumbly right through, chip them out right down to solid earth.



(A) FEATHERED EDGES OF PATCH WILL BREAK OFF (B) EDGES OF OLD CONCRETE PROPERLY UNDERCUT

Patches in a concrete path should always be undercut.

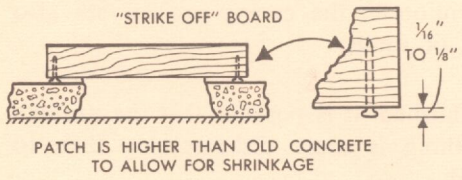
Always make sure to undercut the edges of any patches chipped out. To do this, make the bottoms of the holes wider across than the tops, for this gives a " dovetailing " effect for the new filling that will help key it to the rest of the path. If the patch is not undercut like this, the top of the filling will be " feather edged " and easily broken off. Unless the concrete has to be chipped

right through down to earth, roughen the bottom of the patch too; then brush away all the chips and dirt, and give the patch a thorough soaking.

Now apply a coat of cement grout to the edges and bottom of the patch. Make the grout up with cement and water mixed to a paste-like consistency and apply it with an old brush. It penetrates into any small cracks or openings, surrounds irregularities in the edges or bottom of the patch, and provides a further key for the filling.

If the patch is a deep one, fill it to within ½" from the surface of the path with a mixture of 4 parts metal screenings to 2 parts of sand and 1 part of cement, leaving room for a topping or surface course. Make sure this filling is thoroughly mixed, not too wet, and consolidate it by tamping it down firmly.

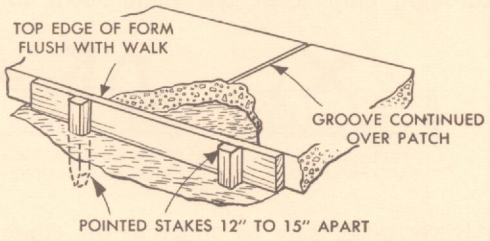
With shallow patches—say those between 1" and 1½" deep—there is no need to use a 4 : 2 : 1 filling. With these, and with the topping course for the deeper patches, use a fairly stiff mixture of 2½ parts sand to 1 of cement. Be careful not to make the mixture too wet.



An easy way to over-fill patches.

Fill the patches—or rather over-fill them—with this topping course, then level it off with the striker board. It is a good idea to drive a couple of nails into the bottom edge of the striker board—wider apart than the width of the patch being repaired—so that the nail heads project slightly, say about ⅛". Then, when the striker board is used to level off the filling, the nail heads will ride on the surface of the path adjoining the patch, and the filling will be slightly higher than the rest of the path. This allows for shrinkage and prevents the patch from becoming slightly sunken after the filling sets and hardens.

The initial set of the concrete, or cement mortar, should take place between a half to one hour after the patch has been filled. After this period has elapsed, the surface of the patches can be finished off with a wooden or steel float, levelling them with the surrounding surface of the path, then grooving and edging them if this is necessary.



A side form is required for patches at the edge of a concrete path or driveway.

Of course, if any of the patches are at the edges of the path, it will be necessary to stake a side form along the edge of the path before starting to fill in the patches. Keep the side forms level with the top of the path, and keep the top of the stakes or pegs which support the form boards lower than the

top of the forms, so that they won't get in the way of the striker board. If it is necessary to use these side forms to repair patches in the edge of a path, leave the side forms in place for at least 24 hours after finishing the patch off.

And don't forget to keep the patches dampened down for about a week after they have been finished off, to prevent their drying out too quickly. That's really important !

COLOURING CEMENT

The application of colour is a means of expression in the architectural and decorative treatment of paving and wall surfaces. Where these surfaces are finished in cement or concrete, the three common methods of introducing colour are :—

1. The exposing of coloured aggregates by acid wash, or grinding with carborundum stones.

2. The thorough mixing of fine, dry colour pigments with the cement.

3. The use of paints, varnishes and lacquers.

Of these three methods, the first will probably be of least interest to the handyman. In this, coloured effects can be obtained by the use of coloured aggregates, such as small chips of marble, granite, special minerals or broken glass. After the cement work has set, the colours are exposed by washing off the surface film of cement with a solution of hydrochloric acid, or by cutting about $\frac{1}{8}$" of the surface away with carborundum stones driven by a grinding machine. This is the method of colouring used in terrazzo work and is usually undertaken only by skilled tradesmen.

The most effective way of colouring cement or concrete surfaces is to thoroughly mix metallic oxide pigments with the cement used for the topping or surface course. In this method, the colouring goes right through the cement mortar and cannot wear out.

It has been found by experience that metallic oxide pigments are the most suitable in this method of colouring. Many indifferent, low-grade colouring matters can be purchased at very cheap prices, but because of their poor tinting qualities, excess quantities of these must be used. In most cases, the additional quantities involved result in the costs being about the same as for the pure metallic oxide pigments. Apart from this, there is the disadvantage of large quantities of low grade pigments reducing the strength and quality of the cement or concrete work. For that reason alone, it very rarely pays to buy cheap, inferior pigments.

Fine, dry colour pigments—mixed with cement—can be used to obtain light, medium and dark red ; buff, yellow, brown and marigold ; blue, light green, dark green and black colouring. White colouring can be obtained by using white Portland cement. By careful planning of these, almost any desired tint may be obtained.

Pigments generally in use are the

Oxides of iron—to produce reds, brown, yellow and black.
Oxide of manganese—to produce black.
Oxide of chromium—to produce green.
Ultramarine and cobalt blue—to produce blue.
Carbon—to produce black.

The amount of pigment used will be between 4 and 10 lbs. to each paper bag or cubic foot of cement, and will vary according to the intensity of colour required. A few experiments should always be carried out to determine the exact proportion of pigment necessary, and every batch of pigment and cement should be carefully weighed to ensure regular uniform shades in the finished work.

There are various methods adopted for the dry mixing of the metallic oxide pigments and the cement. Because of the extra colour value obtained by proper mixing, it is always best to do this part of the work very thoroughly. To get an even distribution of colouring, the pigment and the cement should be mixed dry in a concrete mixer for at least 10 minutes. Another common method is to sieve the pigment and cement—half a dozen times or more—through a fine mesh sieve. This gives fairly satisfactory results, but is apt to prove more costly because of the quantity of coloured pigment that can waste by blowing away.

Pigments remain unaltered in the cement mixture and do not penetrate the particles of sand or cement as would be the case with dyes or stains. As soon as sufficient pigment has been provided—and thoroughly mixed to give the deepest colour—additions of further pigment will not alter the colour value, as sufficient has already been provided to cover the sand and cement. It will be seen therefore, that there is a certain point beyond which it is wasteful to add further pigment. In any case, the amount of pigment used should never exceed 10% of the amount of cement.

Coloured cement work will be darker when wet than dry, because wet surfaces aid the penetration or absorption of direct light. When forming opinions of colour pigments or coloured cement work by inspection, the dampness or otherwise is a matter of importance.

Excess mixing water always brings fine materials to the surface, in which case the very finest particles will be exposed and give the lightest colour effect. This condition is aggravated by excessive trowelling. Where the sand used in the topping course is well graded—and the volume of water is kept down to a minimum—mixtures of 3 parts of sand to 1 of coloured cement can be satisfactory, but this mixture should be the limit. There will be greater assurance of satisfaction by limiting the mixture to not more than 2½ parts of sand to 1 part of coloured cement. With a mixture of 3 parts of sand to 1 of coloured cement, 4½ gallons of water to each bag of cement should be ample; while with a mixture of 2½ parts sand to 1 of coloured cement, 4 gallons of water to the bag of cement should be satisfactory. However, as the

water content of the sand may vary, the volume of water used may require some small adjustment one way or the other. The important thing to remember is not to make the mixture too wet.

For uniformity in appearance, all surfaces should be trowelled when they have set to the same degree of hardness ; that is to say, one part of the work must not be trowelled while it is fairly wet and another part when it is nearly dry. The glossiest and most satisfactory finish will be obtained from material which is trowelled when closest to the set condition. As most coloured concrete and cement work has a smooth finish, a steel float should be used in finishing off. Strokes with the steel float should be made in one direction only when finishing the surface.

Coloured concrete work requires good workmanship, and all possible care, to obtain uniform satisfactory results. One of the most important stages of the job is to see that coloured concrete work is kept in a damp condition for a week—and longer than this if possible—so that the cement may have time to harden properly without the evaporation of mixing water bringing efflorescent salts to the surface. On paths, driveways, terraces and floors, clean damp sand may be used to keep the work covered during the curing period, but it is not advisable to use hessian or jute bags as these are liable to cause stains.

There is a variation to this method of colouring concrete or cement surfaces which is best attempted by tradesmen. In this method, the coloured pigment is mixed with the cement, and this mixture is sprinkled evenly over the surface of the topping course which has been floated up to an even finish with a wooden float.

The coloured cement is then trowelled up to a smooth finish with a steel float. Skill in spreading the colouring evenly—and in the final steel floating—is necessary to produce even, consistent colouring. Obviously, in this method, the colouring is only skin deep.

Even if the work is skilfully executed, the thin layer of colouring is more likely to wear off—or wear out—much more quickly than if the colouring goes right through the topping or surface course.

Probably the easiest way of colouring a concrete or cement surface is by painting it, but the chief disadvantage of painting concrete or cement surfaces lies in the fact that they will show wear in a relatively short time. This is especially true of painted concrete floors and other places where foot traffic is heavy. Touching up at intervals will be necessary and an occasional repainting will be required to keep a good appearance.

But, in painting concrete, almost any desired coloured effect can be obtained, for oil paints, rubber-based paints, synthetic-resin paints, varnishes and lacquers are available in a wide variety of shades and colours. The use and exposure

of the concrete or cement surfaces determine the proper type of paint for them. There are two groups of paint—the organic and the inorganic. In general, inorganic paints cannot be applied with success to concrete surfaces which have been painted with oil paint, unless the latter has been completely removed.

Amongst the inorganic types are cold water paints which should only be used on dry interior walls, and Portland cement paints which are suitable for inside application to walls, but are not recommended for painting floors except in swimming or wading pools. Portland cement paints attain an initial set in from 4 to 8 hours, and, when thoroughly set, provide a really waterproof surface. This surface becomes harder as time goes on if not allowed to dry out too quickly. Portland cement paints can be applied to any type of concrete or cement surface except one that has been steel-trowelled to a smooth, glazed finish, for such a surface is not porous enough to provide a key for the bonding cement paint. The paint should be applied to wet concrete surfaces with an ordinary paint brush and at least two coats are recommended. Each coat of paint should be wetted down as soon as possible after it has become sufficiently hard to prevent injury to the surface. This procedure should be followed with each coat.

Organic paints, among which are the oil paints, may be used where the concrete surface is quite dry, and free from moisture penetration from behind. Organic paints should never be applied to a dense concrete surface, and the painting should not be carried out for several months after construction, to give ample time for the concrete to dry and cure.

The concrete surface should be clean and thoroughly dry when it is ready to be painted. The surface should be neutralized by mopping it with a solution of 4 lbs. of zinc sulphate per gallon of water. After allowing 48 hours for this solution to act with the concrete and dry out, the surface can then be painted.

Three coats of paint are recommended. The first should be very thin and equal parts of thinner and paint give about the proper consistency. Some thinner can be used for the second coat, but for the third coat, no thinner should be added and the paint applied just as it comes from the tin.

Generally speaking, oil paints made from chinawood or tung oil are the most suitable for concrete. Unless the concrete is well aged, fluosilicate should be applied to the finished surface to set the colour of the organic paint, and prevent fading.

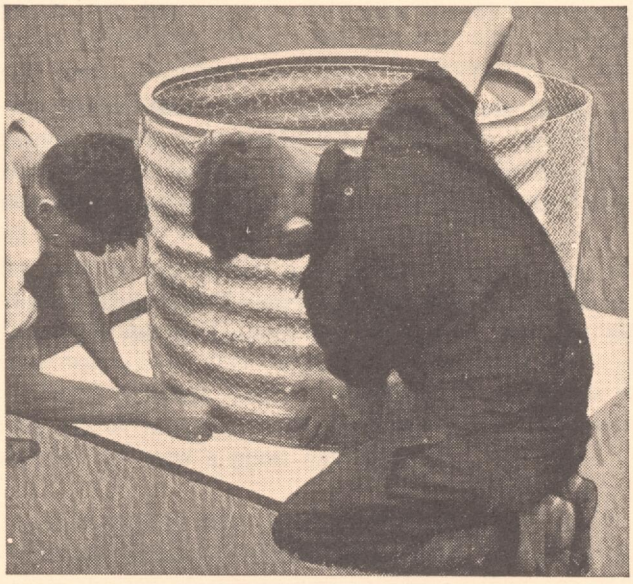
CEMENTING A TANK

Although galvanized iron tanks usually give many years of service, every tank is bound to develop leaks at some time or another.

And with old tanks, it is false economy—and a never ending job—trying to repair leaks as they occur. In lots of cases, cementing an old tank is the only practical alternative to buying a new one, and it's ever so much cheaper too.

As it is necessary to empty all of the water from the tank before starting to cement it, the best time to do this job is just before the wet weather starts, or before it is over. If the work isn't done then, the household may possibly be without rain water all through summer. After the water has been drained out, the inside of the tank should be thoroughly cleaned. To do this properly, it will be necessary to get inside the tank—either through the man-hole or by removing the lid—and give it a good scrub out with a stiff scrubbing brush, or a fairly hard yard broom. After the inside has been scrubbed clean, run the hose in through the top of the tank, give it a good hosing down. then drain the water out again.

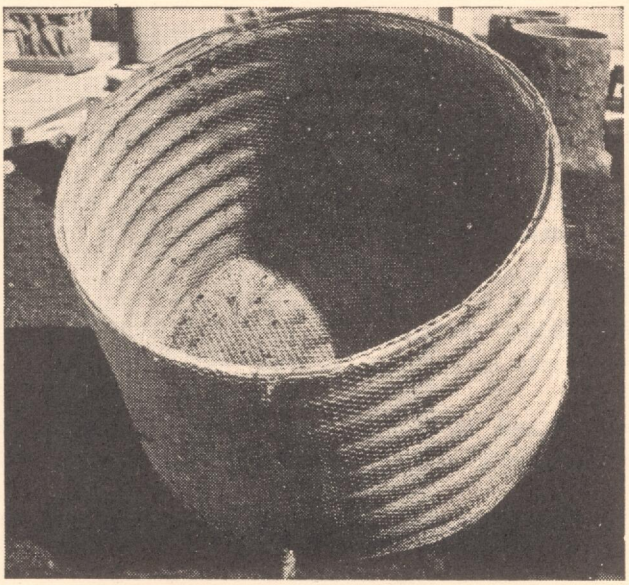
The next step is to cover the bottom of the inside of the tank with a layer of galvanized wire netting. Use 22 or 24 gauge netting with a ½" mesh, and



Layering a tank with wire netting.

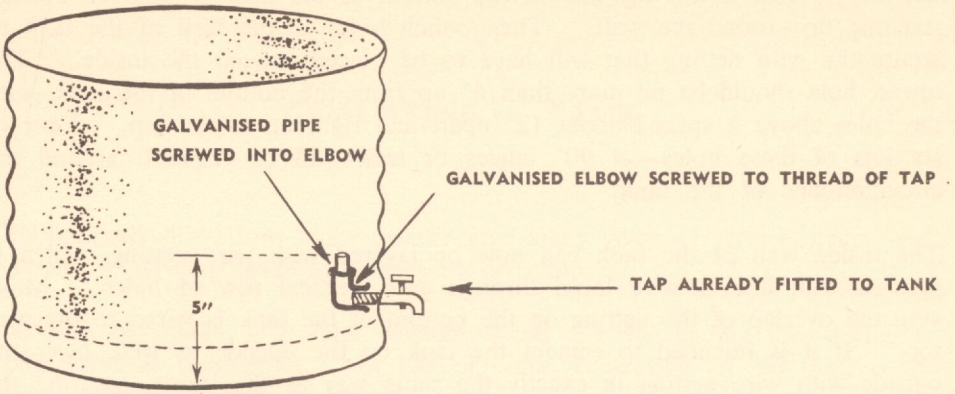
cut this so that it will lay flat on the bottom of the tank, with a 6″ overlap standing up around the wall. Then punch holes in the wall of the tank to secure the wire netting that will have to be placed around the inside. The lowest hole should be no more than 6″ up from the bottom of the tank, with the holes above it spaced about 12″ apart and right up to the top. Four or six lots of these holes—at 90° angles or less—will be required around the circumference of the tank.

The inside wall of the tank can now be layered with wire netting, which is secured with fine tie-wire laced through each vertical row of holes. Make sure the overlap of the netting on the bottom of the tank is wired to the wall too. If it is intended to cement the tank on the outside as well, layer the outside with wire netting in exactly the same way as the inside, securing the netting to the tank with tie-wire as before.



A tank completely layered with wire netting.

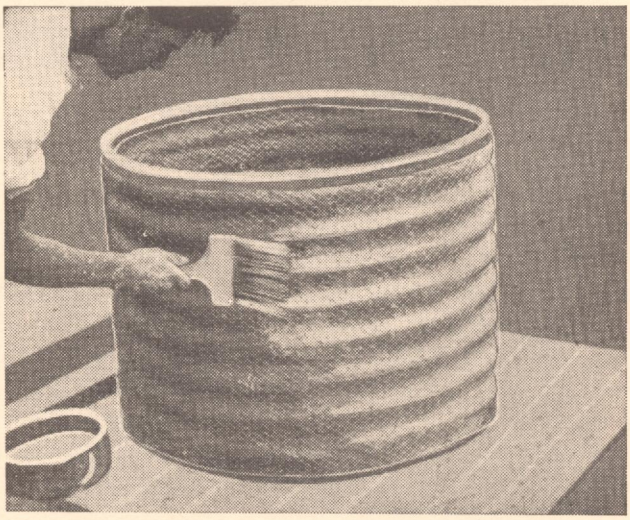
As it will be necessary to cement the bottom of the inside of the tank to a depth of about 2″, check to see if the outlet to the tap is above this level. If it isn't, the dirty sediment that accumulates at the bottom of the tank may come through the tap, so it's best to raise the outlet to about 3″ above the level of the cement bottom—or about 5″ from the iron bottom of the tank. An easy way to do this is by fitting a galvanized elbow on the thread of the tap inside the tank, and screwing a short length of galvanized pipe into the elbow. Only two or three threads on the tap will be needed to be able to do this, but if there isn't enough thread protruding, butt the elbow and pipe right up against the end of the tap, and cement it in when cementing the bottom of the tank.



Raising the outlet for the tap in a tank.

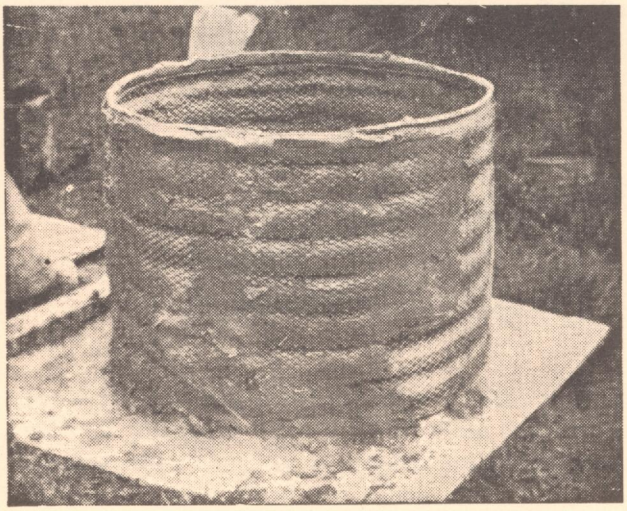
The next step is to mix up a cement mortar of 2 parts sand to 1 part cement, using somewhere between 3½ to 4 gallons of water for each bag of cement. For this particular job, a fairly dry mix is required, so be careful not to use too much water, but keep the mixture turning over until it has an easily workable consistency. Spread the cement mortar over the bottom of the tank to a depth of 2", taking care to work it right up against the wall. Tamp the cement mortar down thoroughly, level it off with a short striker board, and finish the surface with a steel float. Although it may be awkward working in such a small space, there's no need to be too fussy with the finish, for nobody is ever likely to see it.

Allow between 18 and 24 hours for the cement bottom to set and harden, for it will be necessary to stand on this when cementing the walls of the tank.



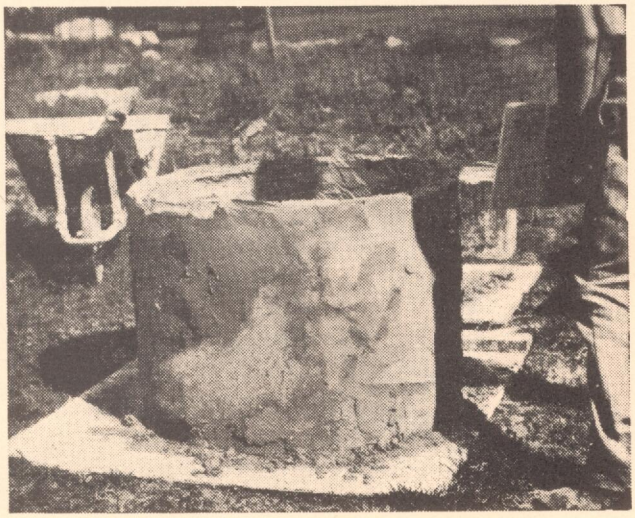
Applying cement slurry to outside of tank.

Before starting to do this, mix up cement and water in a bucket to form a paste-like slurry or cement wash. Throw this over the tank wall—and the wire netting—with a brush. An old kalsomine brush is ideal for this, and the cement wash provides a bond between the galvanized iron and the mortar. Then spread the cement mortar over the wall of the tank, taking care to thoroughly work the mortar in to fill up the space between the wall and the wire netting. Use a steel or wooden float to spread the mortar and work from the bottom upwards. Don't worry about dropping mortar on the floor of the tank, for it can be picked up every now and then and used over again. And don't try to get a smooth even finish, for, when the wall of the tank has been completely covered with cement mortar, it is a good idea to roughen up the surface of the mortar to provide a bond for the next coat. A stiff yard broom is as good as anything for doing this, but wait until the mortar is almost hard before roughening up the surface.



The first coat of cement mortar being applied to outside of tank.

Applying the final coat of cement mortar.



After the first coat of mortar has set and hardened, keep it damp for two days before applying the next coat—in similar fashion to the first. To make a real good job, three coats of mortar should be applied in all, and the last two coats should each be approximately ½" thick. Remember to thoroughly moisten each coat before applying the next, and, with the last coat, trowel the surface up to a smooth, even finish with a steel float.

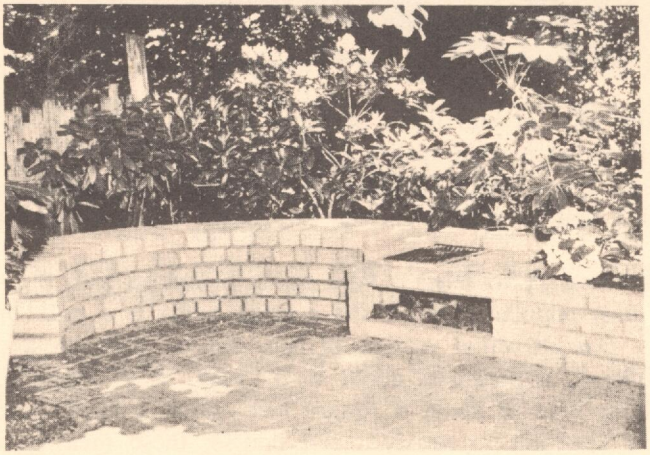
If the outside wall of the tank is to be cemented too, follow the same technique as for the inside wall. Remember to give the galvanized iron—and the wire netting—a coating of cement wash or slurry to ensure a good bond for the first coat of mortar.

Don't use the tank to store water for at least a week after it has been cemented, but keep the walls damp over this period for proper curing.

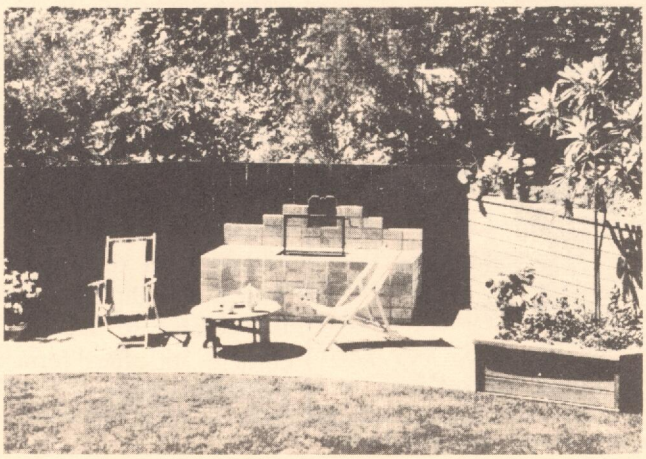
By following the steps outlined, and paying particular attention to the curing, the tank should now give many years of trouble-free service.

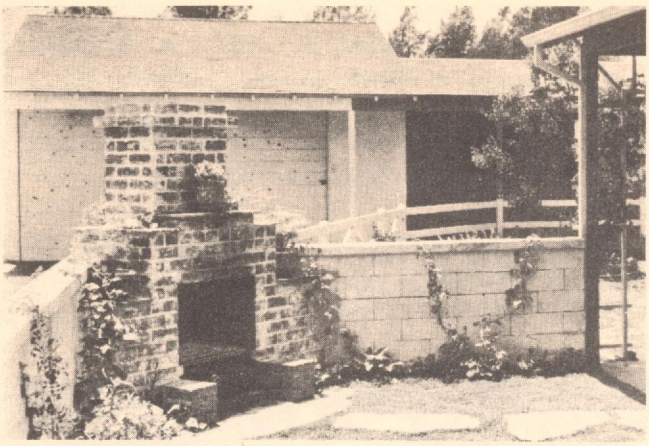
BUILDING A BARBECUE

More and more people are turning towards outdoor living and entertaining, particularly when the weather is fine and the evenings are warm. And nothing adds greater pleasure to the joy of outdoor living than a tasty barbecued meal.



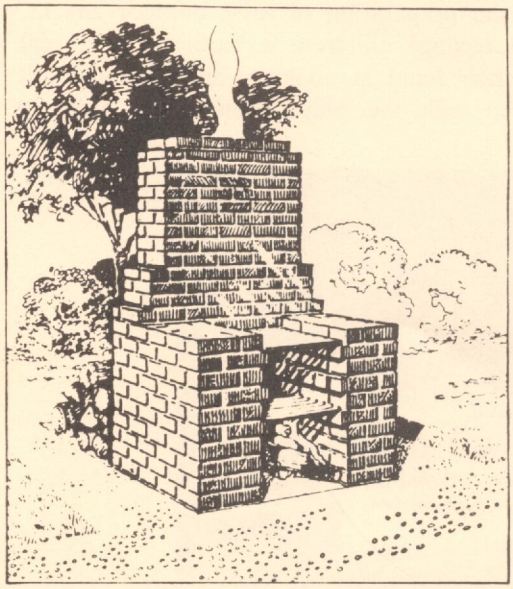
There is something about barbecue cooking that makes it different from all other ways of preparing food. Even those who are unskilled in the art of indoor cooking often claim to be experts on the preparation of tasty outdoor snacks. In homes where there are young and teenage children, a barbecue is a real attraction. The kiddies love to try their hand at cooking, and of course, it saves mothers a lot of work compared with the preparation of an ordinary meal.





There are many ways of building a barbecue and whole books have been published which illustrate a wide variety of types and designs. These vary from the open fire-pit type—which is basically a hole in the ground—to elaborate structures which feature inbuilt storage cupboards and serving benches.

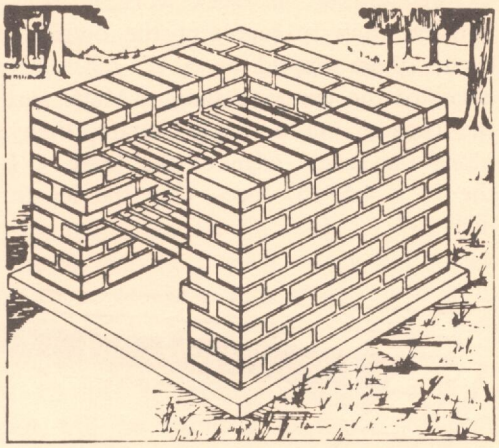
Although it is necessary to select a type which blends in with the surroundings, probably the most popular style for the average home is a grill, or range type, of barbecue. An attractive version of this can be built on a concrete slab 4″ thick. Overall, it measures about 4′ 6″ wide, 2′ 9″ high, is 3′ 6″ deep, and has a grilling area of about 4 square feet—quite a handy size when there are some good appetites to satisfy. Of course, these measurements can be varied to suit individual tastes. It can be built with a fairly wide chimney between 5′ 6″ and 6′ high. With this particular type of barbecue, a chimney is not absolutely necessary, but it does make a much more attractive job.



This is the style of barbecue described herein.

In building a barbecue like this, the first thing to do is to dig out 2″ of soil from a rectangular area 4′ 6″ long by 3′ 6″ wide. Next, cut 4″ wide form boards to fit the rectangle, and position them so that the top edges of the form boards are about 2″ above ground level. Drive three stakes into the ground along the outside face of each of the four form boards—one stake at either end of each board and one in the middle —then level the tops of the forms with a straight edge and spirit level. Be careful to make sure that the corners of the form boards are perfectly square.

It is a good idea to give the front form board a fall of between ½" to 1" from the back form. When it rains, this will provide a run-off towards the front of the barbecue. After this has been done, lightly nail the form boards to the stakes. Remember to always nail through the stake and into the form, so that it is easy to remove the forms later on without any risk of damage to the edges of the concrete.



A similar type—but built without chimney.

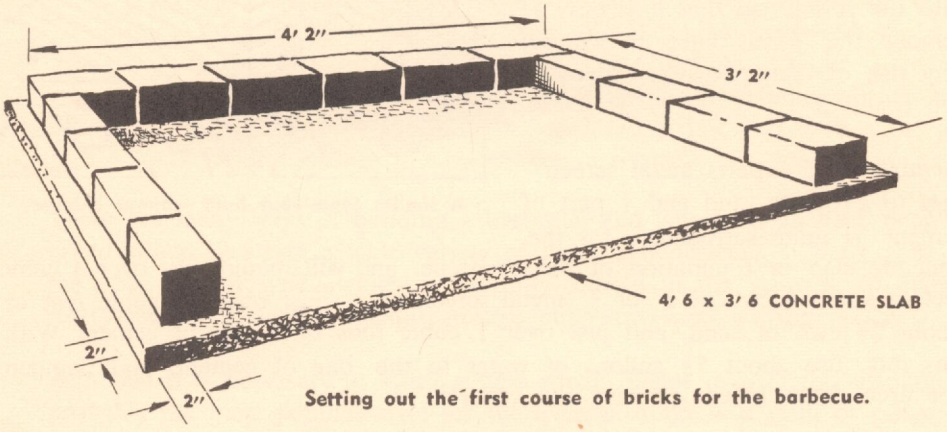
A mixture of 4 parts metal screenings to 2½ parts sand and 1 part of cement is quite satisfactory for the concrete slab or foundation of the barbecue, and will require just over 4 cubic feet or about 4 cwt. of ⅝" or ¾" metal screenings, just over 2½ cubic feet or about 2½ cwt. of sand, and just over 1 cubic foot or 1 bag of cement. With this mix, use about 5½ gallons of water to the bag of cement, and dampen the area down before pouring the concrete.

After mixing the concrete, pour it into the rectangular form and spread it out evenly with a rake or shovel. Slightly overfill the form and tamp the concrete down to thoroughly consolidate it. Use a straight edge—resting it on top of the forms and drawing it across the surface of the concrete with a side to side or sawing action—to level the concrete with the tops of the form boards. As the bricks for the barbecue are to be laid on top of this concrete slab or foundation, it isn't necessary to float it off to a smooth finish. A rough finish provides a better bonding for the mortar which will be used to lay the bottom course of bricks, and it is easy to smarten up any of the concrete that shows later on.

Leave the form work around the concrete slab for at least 24 hours and keep it dampened down so that it will not dry out too quickly. In any case, it will have to be left for about a week before laying the bricks on it.

A barbecue of this type and size will require between 300 and 325 standard size bricks, if built with a chimney. The chimney takes about 100 to 125 of these, so, if it is decided to build the barbecue along these lines—but without a chimney—about 200 standard size bricks should do. Well-burnt clay bricks are the most suitable, particularly for the firebox of the barbecue, as these will withstand the heat much better than softer bricks. And for a really attractive job, texture finished bricks can be used for the outside. If this is done, about 110 texture bricks and about 90 well-burnt clay bricks will be required, plus another 100 to 125 texture bricks if it is decided to build the barbecue with a chimney.

Before starting the brick work, it is a good idea to rule chalk lines on the concrete slab to represent the outside edges of the bricks. With this barbecue, there should be a 2″ space between these ruled chalk lines and the edges of the concrete slab. Make sure the chalk lines are straight, and that the corners are perfectly square, then place a full bottom course of bricks along the inside edge of the lines. Lay the bricks on the "flat"—that is the 9″ x 4.5/16″ face—with the length of the brick running along the chalk line.



Setting out the first course of bricks for the barbecue.

At this stage, the bricks should represent three sides of a rectangle about 4′ 2″ long and 3′ 2″ wide, with only two bricks touching the line representing the front of the barbecue. Space the bricks out, leaving about ⅜″ gap between each for the mortar joint. This spacing can be varied a little to get full bricks—and perhaps one half brick—along each line. When the bricks have been arranged like this, make a chalk mark on the concrete slab at each space left for the mortar joint. When the bricks are later placed in position without mortar, the ruled lines and joint marks will make it easier to get the first course of bricks properly aligned.

At this point, it will be necessary to decide on the width of the firebox wall. A wall 13½″—or a brick and a half wide—is ideal. It is quite wide enough to rest plates on, and provides a 5″ cavity which helps insulate the outer wall from the heat of the fire.

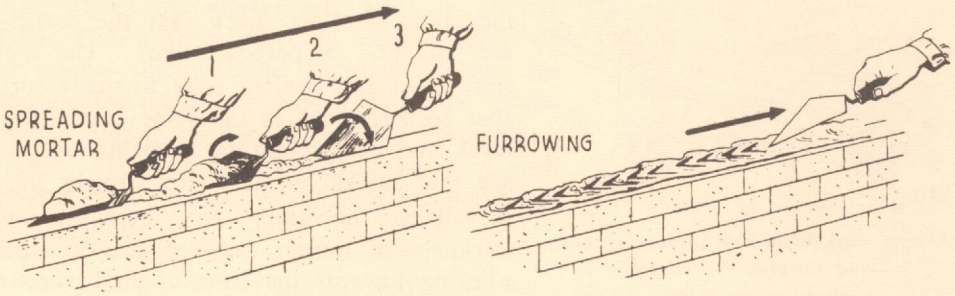
The next step is to lay out two more lines of bricks to form the inside walls for the sides of the firebox. Place these parallel with—and inside—the bricks already placed along the 3′ 2″ depth of the barbecue. Once again, make sure the rows of bricks for the inside walls are perfectly straight, are parallel with the outer walls, and that the front corners are perfectly square. Then mark the concrete slab with chalk lines representing the edges of the bricks and mark off the spaces left for the mortar joints.

Although lime-cement mortar is generally used for most brick work, a fireclay-cement mortar is best for the brick work for the firebox of a barbecue, because

of the heat-resisting properties of fireclay. But since fireclay-cement mortar would have to be specially mixed for the firebox, and it is just as suitable as lime-cement mortar for overall use, it may save a lot of trouble to use fireclay-cement mortar for all of the brick work. For either fireclay-cement or lime-cement mortar, a mixture of 4½ parts sand to 1 part of cement and a ½ part of fireclay or hydrated lime is quite satisfactory.

As a rule, between 60 and 70 standard size bricks can be laid with 1 cubic foot of mortar. So about 3 cubic feet of mortar will be needed to lay the bricks for this barbecue without a chimney, or about 4½ cubic feet of mortar if it is decided to build the chimney too. With a 4½ : 1 : ½ mixture, 3 cubic feet of mortar will require about 3½ cubic feet or 3½ cwt. of sand, ¾ cubic foot or ¾ bag of cement and ⅜ cubic foot or 15 lbs. of fireclay or hydrated lime. Of course, half as much material again will be required to make sufficient mortar to build the barbecue complete with chimney.

The bricks should be given a good soaking before laying them, so that they will not absorb too much moisture from the mortar, and weaken the joint. The bricks should be damp, but not dripping wet, when they are laid.



Spreading and furrowing the mortar in bricklaying.

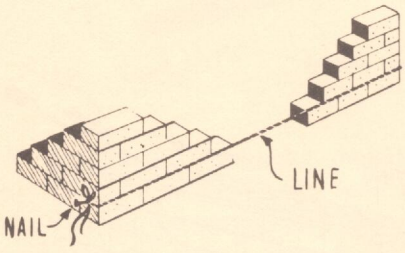
Start off by laying the corner bricks in the first course of bricks already placed and marked out on the concrete slab. Use a pointed bricklayer's trowel, slice out a trowel full of mortar, and spread it about ½" thick on the slab where the brick is to be set. The easiest way to do this is to lay the blade of the trowel flat on the slab, turn the trowel over towards the body so that the mortar begins to slip off the blade, and increase the angle of the turn as the trowel is drawn along to cover the length of the brick. With a bit of practice, it will be easy to spread the mortar quite evenly like this. But only spread enough mortar to cover one brick at a time. Then, make a wide furrow along the centre of the mortar that has been spread on the concrete slab. Do this by drawing the trowel along the length of the mortar, keeping the point of the trowel down, and the blade fairly flat.

Now set the brick on top of the mortar and press it firmly into place, trim off excess mortar from the edges, and "butter" this on the end of the brick facing the next brick to belaid. This "buttering" is the spreading of mortar over both upright edges of the end of the brick, to form the joint. Exper-

ienced bricklayers " butter " the end of each brick with just two strokes of the trowel and they do this to each brick before laying it. But for those with less experience, the easiest way is to " butter " the end of each brick after it has been laid. After the corner bricks in the first course of bricks set out on the concrete slab have been set in mortar, lay the others in exactly the same way, keeping the top of each brick level with the one before it.

The chalk marks made on the slab will help in getting the correct position for the edges and the joints of the bricks, but it is wise to check with the straight edge to see that all edges are perfectly straight, and that all corners are square. After the first course of bricks have been set in mortar like this, build up each corner two or three courses high in turn. Spread the mortar on the bricks underneath, furrow it along the centre with the point of the trowel, set another brick in the mortar, press or tap it down level, trim off the excess mortar with the trowel, then " butter " the mortar on to the end of the brick just laid.

And always use a full brick to overlap each vertical joint between bricks.

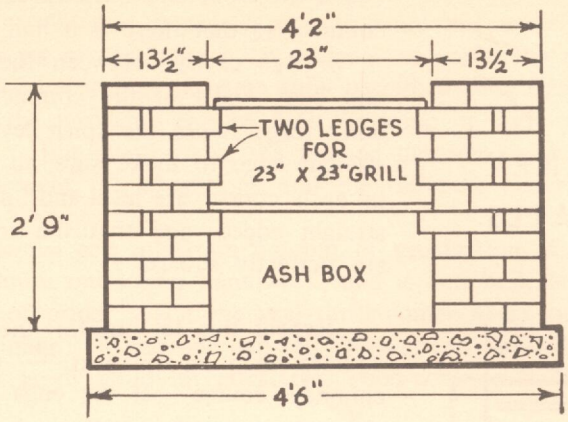


Always work from the corners or ends —and towards the centre— when laying bricks.

As each corner is built up like this, use the spirit level to check that the corners are " plumb " or perpendicular. Use the spirit level and straight edge to make sure that corner bricks in the same course are level, and check with the straight edge to see that bricks are laid in a straight line. It will be necessary to increase the thickness of mortar between bricks when working towards the front of the barbecue to compensate for the ½" fall in the concrete slab. It should be possible to do this, without the extra thickness of mortar being noticeable, when the front corners are three or four courses high. When the corners of the brick work have been built up to this height, they should all be level with each other. After the corners have been built up like this, follow the same method to brick in between the corner. Do not be afraid to make frequent checks to see that the bricks are set " plumb," level and straight edged.

Now go ahead and build the bricks up 9 courses high all round. On the 5th course, set the faces of the bricks for the inside walls of the firebox out 1" from those underneath, to support ½" diameter steel rods which will serve as a grate or open grill. About a dozen of these rods—27" long—will be required. They are built in by laying them 3" apart—on top of the protruding bricks in the 5th course, and laying the 6th course of bricks over them. Still retain the ½" thickness of mortar between the 5th and 6th course and set the faces of the bricks in the 6th course back 1" to match the earlier courses.

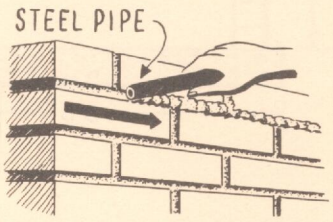
On the 7th and 9th courses, set the faces of the bricks out 1" again to match



FIREBOX DETAILS

the 5th course. This will provide support, at two different levels, to slide in hot plates or warming trays. On the 10th and last course, lay the bricks for the firebox walls so as to fill in the cavity between the inner and outer walls.

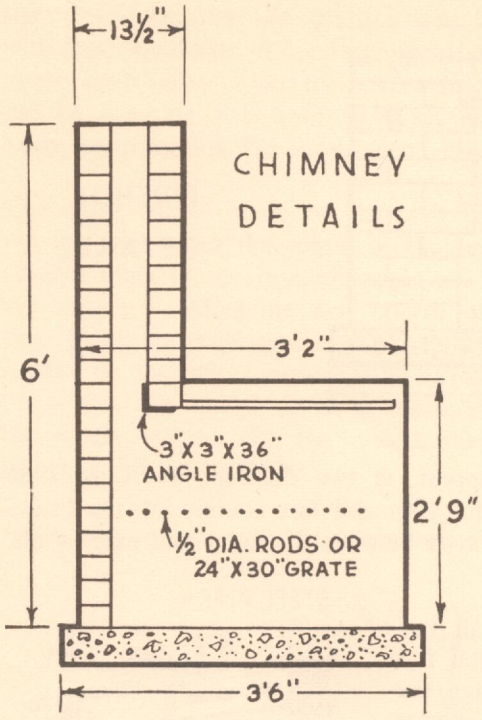
And before the mortar sets, trim up all the joints. Use a short piece of round metal rod or piping—slightly larger in diameter than the width of the joint—and draw it along the mortar in the joint to produce a smooth, concave surface. Trim up all the vertical joints in each course like this before trimming up the horizontal joints.



Trimming up the mortar joints between bricks.

If it is intended to build a chimney on to the barbecue, set a 3′ length of 3″ by 3″ angle iron on top of the second-last course of bricks in the side walls of the firebox. Place this so that one flat side of the angle iron is vertical and 4½″ away from the bricks in the back wall, and the other flat side is horizontal. The ends of the lengths of angle iron should be about 7″ in from the edge of each outside wall of the firebox. In this position, the horizontal side of the angle iron will hold the first course of bricks for the front face of the chimney. Now lay the last course of bricks for the firebox walls so as to fill in the cavity between the inner and outer walls. Build this last course of bricks over and around the angle iron support for the chimney. Then, run about ⅜″ of mortar along the horizontal side of the angle iron and set bricks along this—on the "flat" of course—so that they are level with the top course of bricks in the firebox walls. This will set out the first course of bricks for the chimney.

Build up another course of bricks, working from each corner of the chimney in turn and taking care to overlap each joint between bricks with a full brick. On the next, or 3rd chimney course, set the ends of the chimney in a half brick from the outside edges of the firebox walls. Maintain a constant width be-

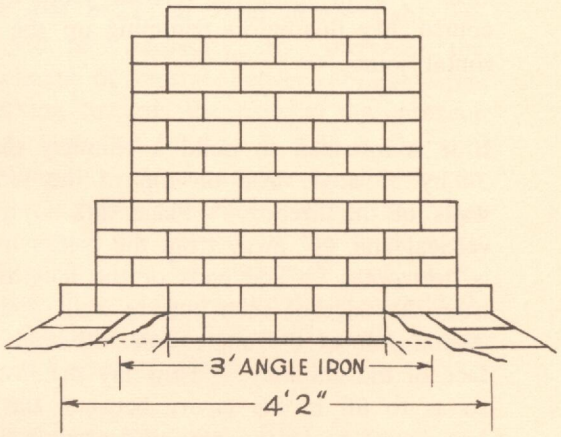


tween the front and back faces of the chimney so that there is a half brick — or 4½" cavity—between the front and back walls of the chimney. And don't forget to use the spirit level and straight edge to make sure all bricks in each course are level and "plumb," straight edged, and that the corners are perfectly square.

Repeat this set out for another 2 courses, then on the next — or 6th chimney course—set the ends of the chimney in another half brick, still maintaining that 4½" cavity between front and back faces.

Then repeat this last set out for another 5 courses, which should give a chimney somewhere about 6' high. On the last or 12th chimney course, set the ends of the chimney in another half brick to finish off.

As the chimney is being built up, it may be desired to make variations to the set out mentioned above, and this can be done according to individual taste. But make sure to trim up all the joints before the mortar sets. After this has been done, the only thing left is to smarten up those parts of the concrete slab or foundation that show.



Brick set-out for the barbecue chimney.

Mix up a small amount of mortar consisting of 2½ parts sand to 1 of cement, keeping it fairly dry. Dampen down the concrete slab, then spread the mortar about ½" thick over those parts of the slab that show. Tamp the mortar down to consolidate it, leave it between a half to one hour before attempting to finish it off, then float it with a steel float to get a good, smooth finish. Use an edging tool to get nice rounded corners at the edges of the slab or foundation —and the job's finished.

Old wood stoves are used a lot these days as a barbecue and they can be

made quite attractive by building them in to the type of barbecue described herein. All that is necessary is to build the inside of the firebox to suit the dimensions of the stove. A number of variations can be made to the style of the barbecue that has been fully described—the size and shape can be altered —and the barbecue can be built in stone or with concrete blocks instead of bricks. But in all cases, the method described can be followed step by step, regardless of the alterations and the different materials used.

One always gets a certain amount of satisfaction at being able to stand back and admire one's own handiwork, and a well built barbecue can be a constant source of pride. But the real thrill comes every time it is used for outdoor entertaining. Then one can tell those friends who have been invited just how easy it is to build an attractive, good-cooking barbecue.

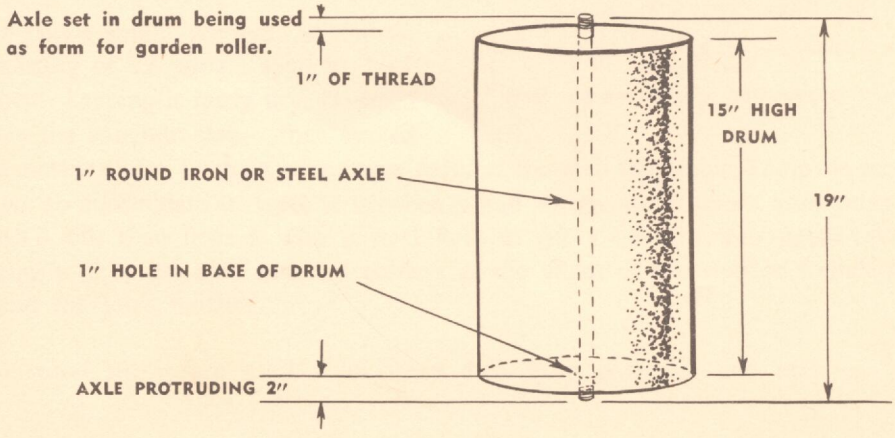
A CONCRETE GARDEN ROLLER

According to the gardening experts, the best lawns are those which receive regular rolling.

It does not follow, of course, that rolling is the only thing necessary in maintaining a healthy, well-kept lawn, for regular feeding, cutting and top dressing are of vital importance. Very few of the popular types of lawn mowers available today are fitted with rollers heavy enough to be of much benefit to any lawn, so for those who are keen on improving their lawns, a concrete roller which can be made easily and cheaply is a worthwhile proposition.

In making a concrete garden roller, the first thing that is necessary is an empty, straight-sided, five-gallon paint drum to use as a form. These drums are usually about 11″ in diameter and approximately 15″ high. A concrete garden roller made to this size will weigh over 1 cwt. and that is quite heavy enough for average use. Of course, if a larger, heavier roller is required, it will be necessary to use a bigger drum, or build up a cylindrical form from flat sheet metal. If it is decided to build up a larger form like this, take care to support it on the outside with a timber frame, or let it down into a hole in the ground and compact the earth around it. This will prevent the sheet metal from buckling, or being forced out of shape when the concrete is poured into it.

A piece of round iron or steel—1″ in diameter and about 4″ longer that the width of the roller—is ideal to set into the centre of the drum or form as an axle. This length of iron or steel should be threaded for 1″ at either end, to take the nuts which will secure the handle. If a drum is being used as a form, cut a 1″ hole in the centre of the bottom of the drum to take the axle, and sink the lower end of the axle into the ground so that it is 2″ below the bottom of the drum. Be careful to make sure that the axle is set in the


Axle set in drum being used as form for garden roller.
1″ OF THREAD
15″ HIGH DRUM
19″
1″ ROUND IRON OR STEEL AXLE
1″ HOLE IN BASE OF DRUM
AXLE PROTRUDING 2″

exact centre of the drum or form.

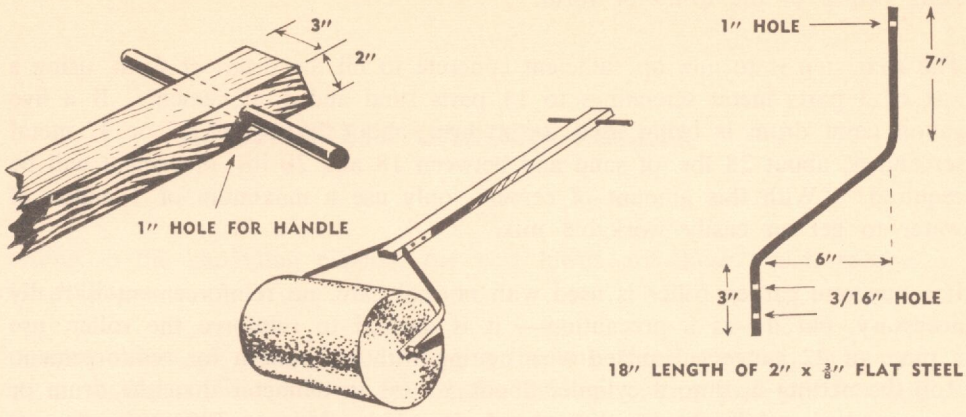
The next step is to mix up sufficient concrete to fill the drum or form, using a mix of 3 parts metal screenings to 1½ parts sand and 1 of cement. If a five gallon paint drum is being used for a form, about 56 lbs. of ½" or ⅜" metal screenings, about 28 lbs. of sand and between 18 and 20 lbs. of cement will be required. With this amount of cement, only use a maximum of 1 gallon of water to get an easily workable mix.

If a concrete garden roller is used with normal care, no reinforcement is really necessary, but if—as a precaution— it is desired to reinforce the roller, use a piece of 22 gauge galvanzied wire netting with a ½" mesh for reinforcement. Roll the netting up into a cylinder about 3" less in diameter than the drum or form, and about 3" shorter than the depth of the form. Before starting to pour in the concrete after it has been mixed, grease the inside of the form. Any ordinary car grease will do for this. Then pour about 1½" of concrete into the bottom of the form, making sure the axle is set exactly in the centre, with one end 2" below the bottom of the form. Tamp the concrete down well to thoroughly consolidate it, taking particular care to see that it is well compacted around the inside wall of the form. Unless this is done, there is a possibility that some of the metal screenings may remain in direct contact with the form, and for a nice smooth finish, the screenings should be surrounded by a good coating of sand and cement slurry.

If it has been decided to reinforce the roller, place the cylinder of netting over the axle and let it rest on the concrete that has just been poured, keeping the sides of the netting 1½" away from the inside of the form. Now go ahead and fill up the drum or form with concrete, tamping it down thoroughly every 2" or so, and keeping the axle and the reinforcement in the correct position. When the form has been filled up like this, there should be 2" of axle protruding from the top of the concrete. Make sure the axle is in the exact centre of the form.

After the concrete has set and begun to harden, throw a bag over it, and keep it dampened down for about one week before removing the form or drum. If it is necessary to cut the drum to get it off, be careful not to damage the concrete. Of course, if the outside of the drum is perfectly straight-edged and has a good surface, it can be left on if desired. That way, it will be possible to wear the drum out before there is any wear at all on the concrete.

All that remains now is to fit the handle. For this, two pieces of 2" x ⅜" flat steel—both 18" long—will be needed. Drill a 1" hole for the axle about 1" away from the end of each piece, bend them so as to clear both ends and the face of the roller, and bend a 3" shoulder on the other end of each to take a wooden handle 3" wide. Then drill two holes through each shoulder to take ⅜" bolts to secure the handle. Make sure these holes line up.

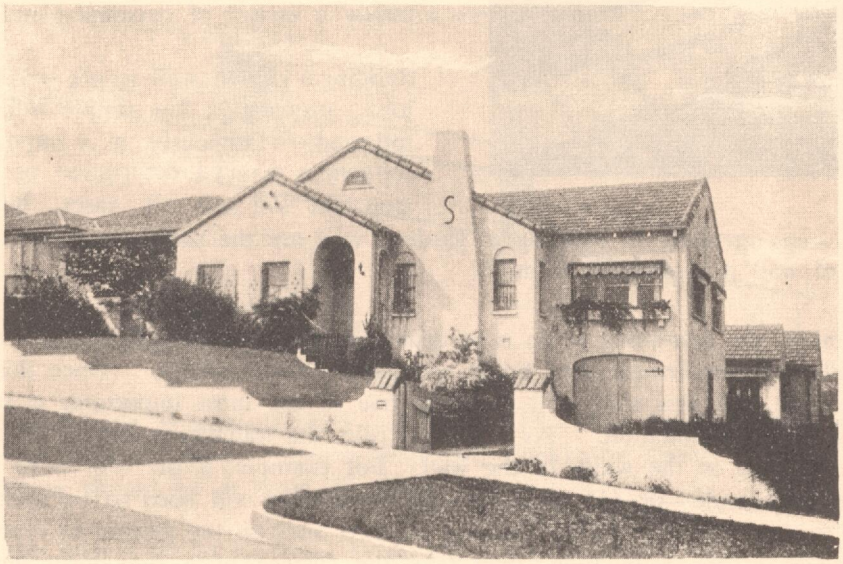


Details of handle for garden roller.

A 3′ length of 3″ x 2″ hardwood makes an ideal handle, although this can be made longer or shorter as desired. The length of hardwood will have to be drilled at one end with two holes to take the ⅜″ bolts. A 1″ hole is drilled at the other end of the hardwood to take a wooden dowel—or round metal rod—of this size, which will give a comfortable hand grip. When assembling the handle, fit the hand grip first of all, then fit the two pieces of 2″ x ⅜″ flat steel to the axle and secure with 1″ nuts. Finally, fit the handle to the piece of 2″ x ⅜″ flat steel and secure with two 3½″ x ⅜″ bolts and nuts.

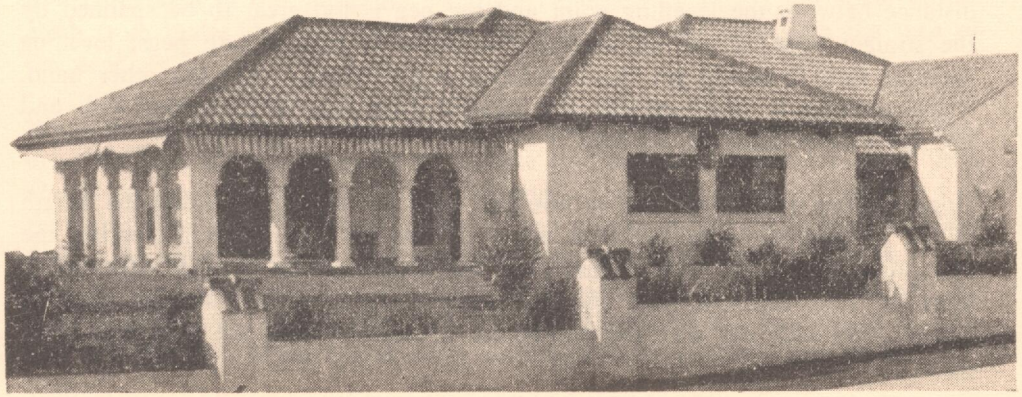
A concrete garden roller made along these lines will give many years of service, and will come in handy for many other jobs around home in addition to rolling the lawn.

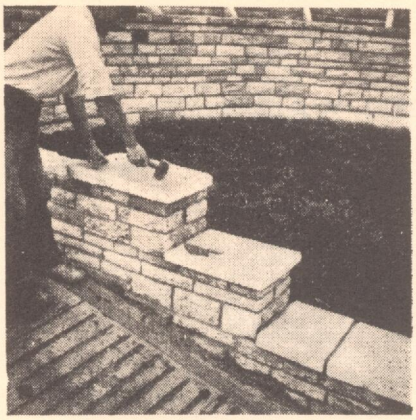
BUILDING A GARDEN WALL



Nothing adds more to the appearance of a home and garden than a well built garden wall.

There is plenty of scope for individual tastes when it comes to building a garden wall, for they can be built in a wide variety of shapes and sizes. They can make effective wind breaks, or attractively seclude portions of a garden; they can be built as retaining walls for the soil in terraced layouts, and many are built to replace the plain looking fences which were the usual thing some years ago.





Some people prefer plain walls, others like fancy ones—they can be straight or curved, wide or narrow — level for the full length, or stepped or terraced to suit the landscape. They can be built with bricks or stone, with cement blocks, or entirely of concrete — it is purely a matter of personal taste.

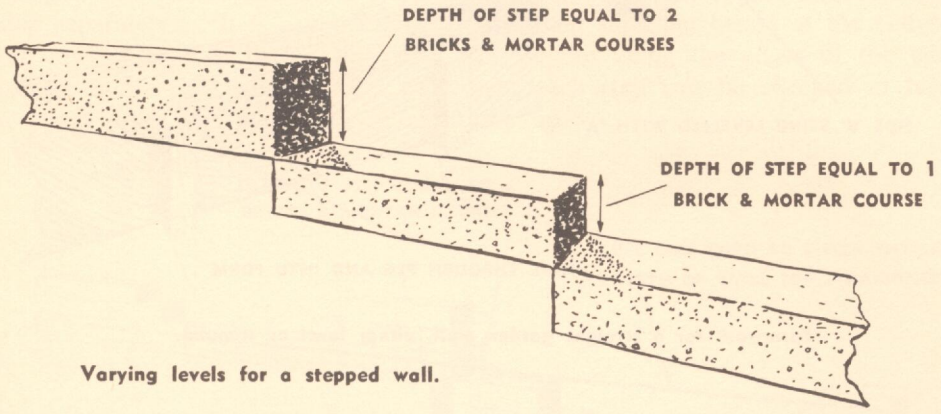
Building a garden wall is not a difficult job, provided a few simple rules are followed. Obviously, it is impossible to give a detailed description of every step that will suit all cases, but the basic steps involved in building a garden wall are the same regardless of the type of wall it is decided to build.

Of course, the first thing to do is to decide on the type of wall that will blend in with—or complement—the home and garden surroundings. Once this has been done, the first step, and probably one of the most important, is to set levels for the foundation. As a general rule, the foundation should be about twice as wide as the width of the wall. For example, if the wall is to be a single brick wide—or 4½″ in width—the foundation will need to be about 8″ or 9″ wide. So start off by marking out two lines on the ground to represent the edges of the foundation, then take the surface of a previously levelled garden path, the top of the house foundations, or the surface of the footpath in the street—whichever is closest and most convenient—as a point from which to establish levels.

Drive a levelling peg into the ground at the end of the foundation nearest to the point from which the levels are to be established, keeping the peg about 1″ outside either one of the two lines representing the edges of the foundation. Now place a straight edge—with a spirit level resting on top of it—on the point from which the level is going to be established, and on top of the peg. Raise or lower the peg until it is perfectly level. Of course, if the distance between the levelling point and the peg is too great to be spanned by the straight edge, it will be necessary to drive in intermediate pegs, levelling these in turn to finally get the foundation peg levelled. On the other hand, if the distance is short enough, the straight edge can be dispensed with and the spirit level used on its own.

Once the first foundation peg is levelled, drive in other pegs along the length of the foundation—keeping them about 1″ outside the line representing the foundation edge, and slightly less than the length of the straight edge apart. Start off from the first peg, and, using the spirit level and straight edge as before, level each peg with the one before it, until all pegs are level with each other.

Of course, if the foundation is to be stepped, it will be necessary to level the pegs for each step separately—but in the same fashion as described. If the stepped wall is to be built with bricks, make sure the difference in levels between steps is equal to an exact number of brick and mortar courses. This way, a stage will be reached where one course of bricks will run through from one step to another, giving a stronger, better looking wall.

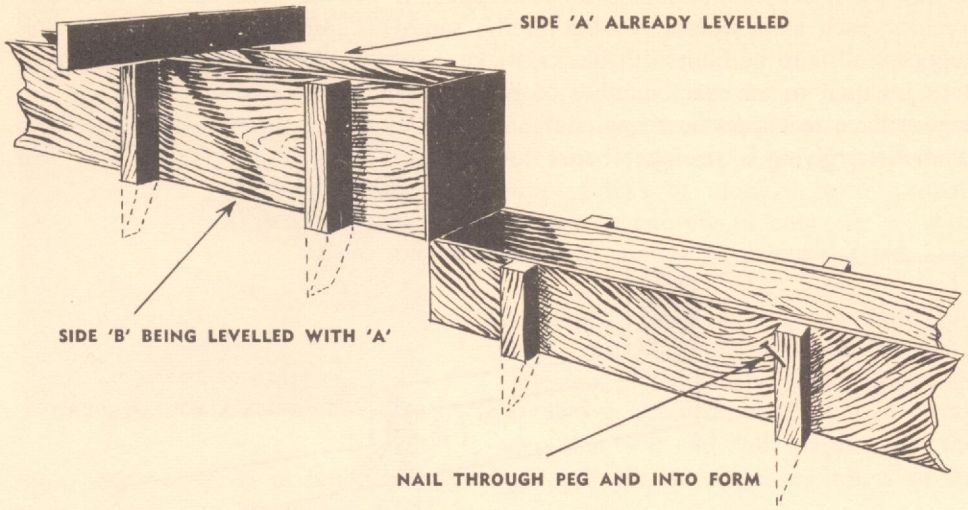


Varying levels for a stepped wall.

If the wall is to be a single brick—or about 4½″—wide, the foundation needs to be at least 6″ deep. For a wall two bricks—or about 9″—wide, the foundation should be at least 8″ deep.

The next step is to set up forms to get the depth required for the foundations. Start off by measuring the height of the tops of the levelling pegs above the surface of the ground, for this will determine, to some extent, the width of the boards to be used for forms. If the tops of the pegs are 3″ above the surface of the ground, use form boards 3″ wide; and use 4″ wide form boards if the pegs are 4″ above the ground, and so on. These form boards should be about 1″ thick, to hold the weight of the wet concrete without bending or buckling. Place the form boards—on edge of course—on the inside of the levelling pegs that have been driven in along the line representing one edge of the foundation. Level the top edge of the form boards with the tops of the levelling pegs, then drive a nail through the pegs and into the form boards to secure them in this position. It may be necessary to dig out some of the earth from under the form boards to get them perfectly level with the tops of the pegs.

When the form boards for one side of the foundation have been fixed like this, drive in some more pegs about 1″ outside the line representing the other side, and place some more form boards—on edge—along the inside of these. Use the spirit level to get the tops of the second line of form boards level with the first, and, when they are, secure them to the pegs with nails as before. Be sure to keep the second row of pegs level with, or slightly lower than, the tops of the forms. Then they will not obstruct the striker board that will be run over the tops of the forms when levelling off the concrete after it has been poured.



Formwork for a straight garden wall, either level or stepped.

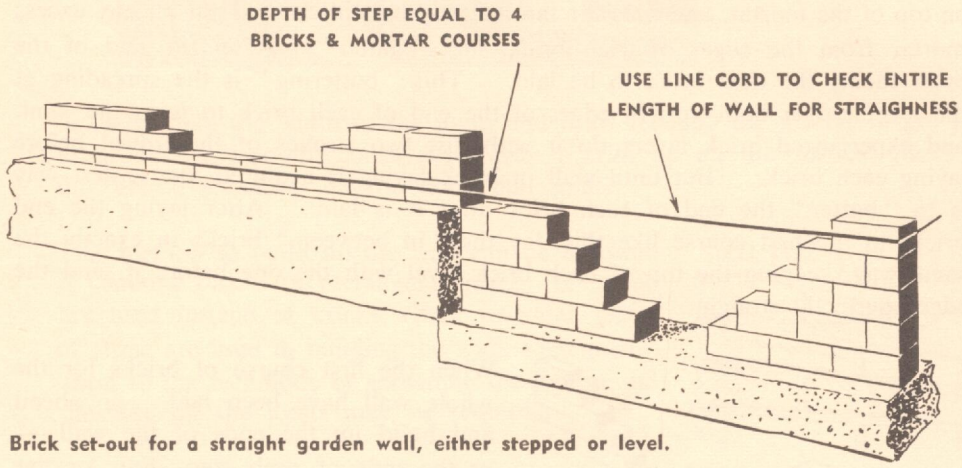
At this stage, it is a good idea to make sure that the form boards are well supported. The supporting pegs or stakes should not be more than 4′ apart. If they are, more stakes should be driven in between—on the outside of the forms of course. The next step is to dig out sufficient earth from between the form boards to give the required depth of concrete for the foundation.

Use a mixture of 5 parts metal screenings to 2½ parts sand and 1 part of cement for the concrete foundation. When the concrete has been mixed, pour it into the forms, spread it out with a rake or shovel, and tamp it down well to thoroughly consolidate it. If the foundation is to be reinforced—and this will depend on the height of the wall and the nature of the ground—this can be done by running two or three reinforcing rods through the concrete. Use ⅜″ rods and lay them—about 2″ or 3″ apart—on the concrete when the form is half filled, then fill the forms with concrete right up to the top. Level the concrete off by drawing the striker board along the top edges of the forms, using a side to side or sawing action.

When the concrete has been poured and levelled off, it must be allowed to harden before the bricks or stones for the wall can be laid on it. It is a good idea to put down the foundation for a wall one weekend and lay the brick or stone work for it the following weekend. The forms should not be removed for at least one or two days after pouring the concrete, and the foundation should be kept well damped down for at least a week for proper curing.

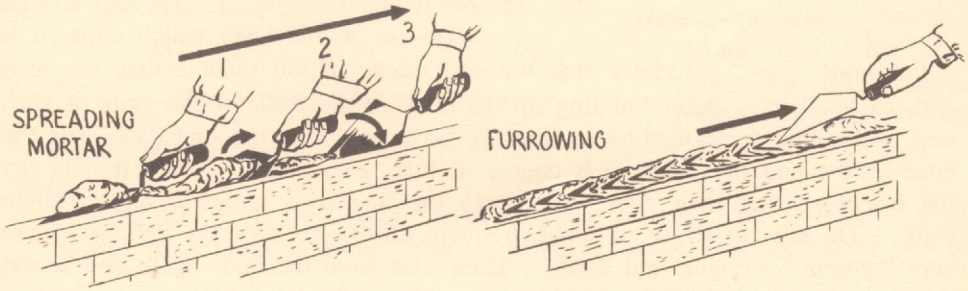
And remember to give the bricks or stones for the wall a good soaking before laying them, so that they will not absorb too much moisture from the mortar, and weaken the joint.

If the wall is being built with bricks, set out the first course of bricks along the length of the foundation, starting from each end and leaving about $\frac{3}{8}$" between each brick for the mortar joints. Lay the bricks on the "flat"—that is, the 9" x 4.5/16" face—and keep them in the centre of the foundation. For a straight wall, run a line cord along one edge of the bricks, draw it tight and secure it, then check to see that all the bricks in the first course are perfectly straight. If the foundation is stepped, it will be necessary to do this with each step separately. It is a good move to build up sufficient bricks at the end of the lowest step, so that a line cord can be run along the edges of the end bricks in the full length of the wall, then each step can be checked in turn to make sure that the bricks in each line up.



Brick set-out for a straight garden wall, either stepped or level.

Use a lime and cement mortar for laying the brick or stone work in the wall. The method of mixing the mortar—and the proportions of the ingredients—has been outlined in a separate section, but a mortar that is quite satisfactory for any type of wall can be obtained from a mixture of 6 parts sand to 1 part hydrated lime and 1 part of cement.

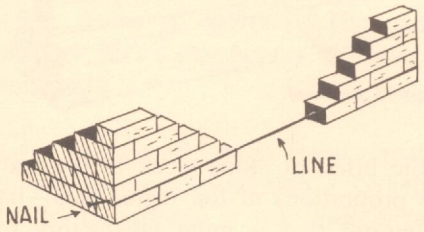


Spreading and furrowing the mortar in bricklaying.

Now start off by laying the end bricks in the first course of bricks set out on the foundation, or the end bricks in each step if the foundation is terraced.

Use a pointed bricklayer's trowel, slice out a trowel full of mortar, and spread it about ⅜" thick on the foundation where the brick is to be set. The easiest way to do this is to lay the blade of the trowel flat on the foundation, turn the trowel over towards the body so that the mortar begins to slip off the blade, and increase the angle of the turn as the trowel is drawn along to cover the length of the brick. With a bit of practice, it will soon be easy to spread the mortar quite evenly like this, but only spread enough mortar to cover one brick at a time.

Then make a wide furrow along the centre of the mortar that has already been spread. Do this by drawing the trowel along the length of the mortar, keeping the point of the trowel down, and the blade fairly flat. Set the brick on top of the mortar, and press or tap it firmly into place. Trim off any excess mortar from the edges of each brick, and " butter " this on the end of the brick facing the next brick to be laid. This " buttering " is the spreading of the mortar over both upright edges of the end of each brick to form the joint, and experienced brick layers do it with just two strokes of the trowel before laying each brick. But until skill in brick laying is acquired, the easiest way is to " butter " the end of each brick after it is laid. After laying the end bricks in the first course like this, lay the " in between " bricks in exactly the same way, keeping the top of each brick level with the one before it, and the edges perfectly straight.



Always work from the corners or ends —and towards the centre— when laying bricks.

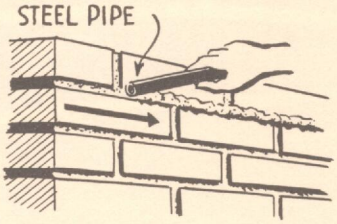
When the first course of bricks for the whole wall have been laid, go ahead and build up the ends of the wall — or the ends of each step—four or five courses high in turn. Always overlap each vertical joint between bricks with a full brick. As the ends of the wall —or the ends of each step—are built up like this, use the spirit level to check that the courses are " plumb " or perpendicular. Use a spirit level and straight edge—or a line level which clips on to a line cord — to check that the end bricks in the same course are level with each other. After building up the ends of the wall, or the ends of each step, follow the same method to brick in-between. Run the line cord over the edge of the end bricks of each course in turn, tighten and secure it, and lay the bricks so that their edges just touch the line cord to get a nice, straight wall. Do not be afraid to make frequent checks to see that the bricks are kept " plumb," straight, and level. Then start from the ends again and repeat the process to build up the whole wall to the desired height.

On the last course, it may be an idea to use fancy bricks, or sill tiles, to get a neat or contrasting finish. Before the mortar sets—and that may be within an hour if a lime and cement mortar is used—trim up all the joints between bricks. Use a short piece of round metal rod or piping, slightly larger in

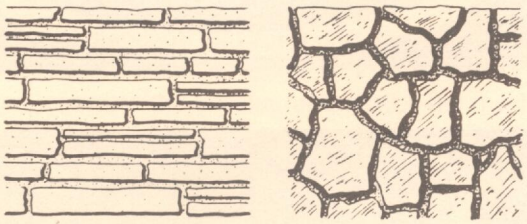
Laying the bricks for a wall.

diameter than the width of the joint, and draw it along the mortar in the joints to produce a smooth, concave surface. Trim up all the vertical joints like this before trimming up the horizontal joints.

This method to build up the wall can be followed if concrete blocks or rectangular pieces of stone are used instead of bricks. Where irregular pieces of stone are used in building the wall, some variation to the technique of spreading the mortar and finishing off the joints may be required.



Trimming up the mortar joints between bricks.



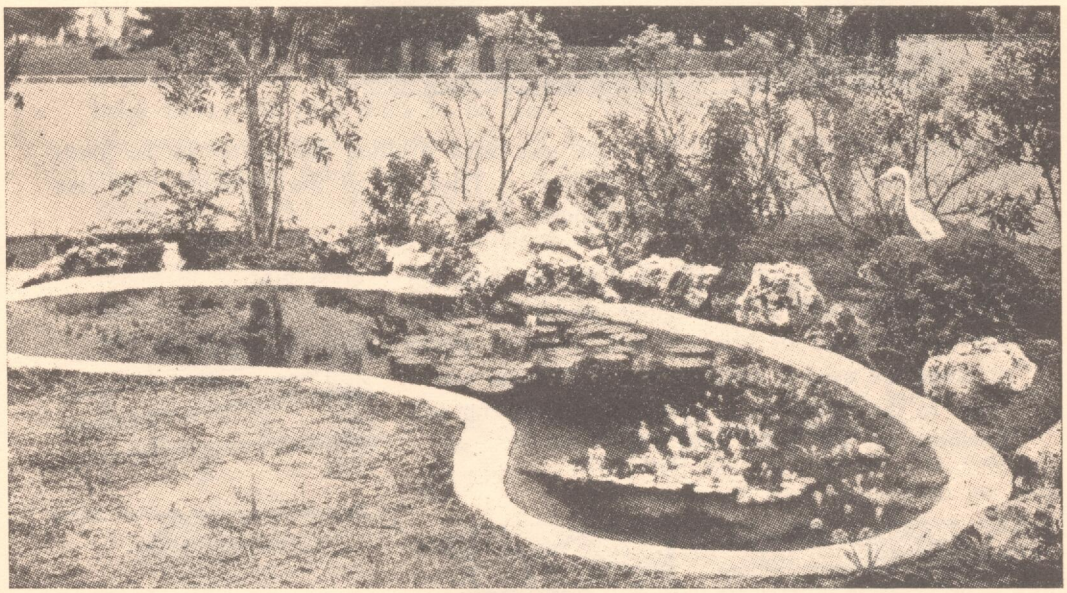
Two different types of stone laying.

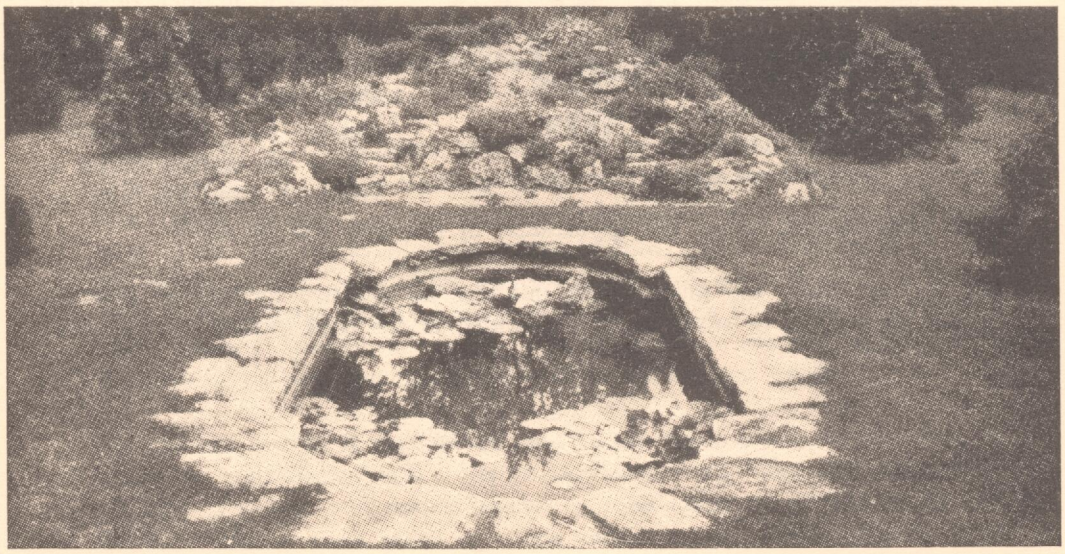
Until skill at brick or stone laying is acquired, it may be difficult to keep the faces of the bricks or stones completely free from mortar. Unless the surface mortar is removed, and the brick or stone work cleaned down, the appearance of the wall will be spoilt.

But do not worry too much about this, for an effective method of cleaning mortar from brick or stone work is provided in the final section of this book.

FISH PONDS AND ORNAMENTAL POOLS

Fish ponds and ornamental pools are a never-ending source of delight, and add great charm to any garden.

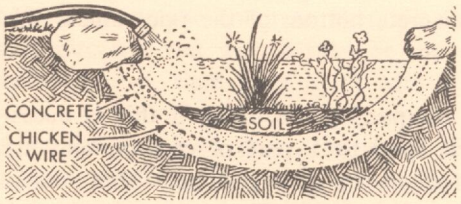




Pools and fish ponds suitable for both large and small gardens can be designed and constructed with ease by the amateur gardener. The cost of construction is small and the tools required to carry out the work are usually in the possession of every handyman. A properly built ornamental pool or fish pond is relatively free from maintenance, lasts indefinitely, and retains its beauty.

There is plenty of scope for individual taste in the design of pools and fish ponds. They can be built in all sorts of shapes and sizes to blend in with the garden layout and harmonise with the natural surroundings.

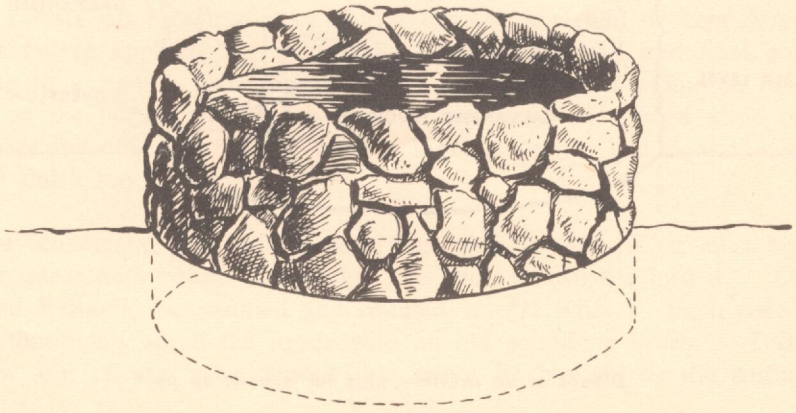
Generally speaking, fish ponds and garden pools can be built in one of three ways. The first of these is known as the " cast in place " method, and in it, concrete is poured into form work to build the bottom and walls of the pool. This method is better suited to the larger, deeper type of pool. It usually involves fairly extensive work on form making that is hardly justified for the kind of pool that most people decide on.



Cross section of a scooped out pool.

Another way to build a pool is by scooping out the earth to the desired form or depth, building a low border or edging just above ground level, then concreting or cementing the bottom and sides of the excavation, and the inside of the border or edging. But although this is probably the simplest way of making an ornamental pool, it may not suit every garden, or every individual taste.

A third method of making a fish pond or garden pool—and as popular a way as any—is to build a retaining wall of rockery or quarry stone to the desired shape, concrete the bottom, and render the inside of the wall with cement mortar. In many cases, a combination of the second and third methods may be desirable. A description of the steps involved in this combination method will give the reader an excellent idea of the stages to be followed for both methods.



A built up pool or fishpond.

The first thing to do is to decide on the size and depth of the pool. This can depend, to some extent, on the type of plants to be grown in it. Small water lilies, for instance, can be grown in a pool of only 3′ diameter, while some of the larger varieties require a pool at least 6′ in its smallest dimension. For water lilies, the pool needs to be at least 2′ deep.

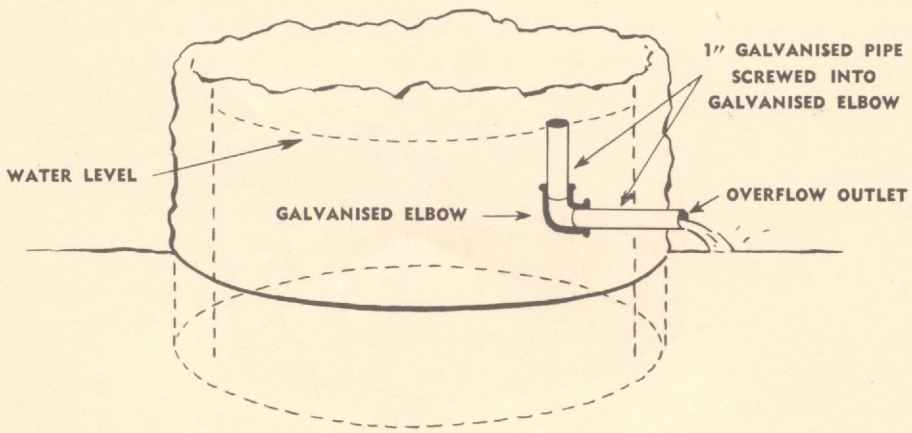
The next thing to decide is the height of the retaining wall above ground level, for this will determine the depth of the excavation, if any. Remember to allow 3″ for the concrete bottom of the pool or fish pond.

While digging out the shallow excavation that may be necessary, take particular notice whether the soil is firm, or whether it is inclined to be loose and crumbly. Unless the soil is firm, it is wise to dig down 6″ deeper than intended and fill in this extra 6″ with metal screenings. Thoroughly compact the filling with a rammer, or the end of a 4″ x 4″ fence post.

There will be a considerable weight of water in the pool when it is full, and the weight of the water might crack the concrete bottom of the pool unless this rests on well compacted ground.

After digging the shallow excavation and compacting the filling if this is necessary, mix up a cement mortar of 2½ parts sand to 1 part of cement, and use this in building up the retaining wall of rockery or quarry stone. Don't make the mortar too wet. Use between 2/3 and ¾ of a gallon of water to each shovelful of cement—or about 4½ gallons of water to each bag of cement. And remember to give the stone a good soaking before laying it, to prevent it from absorbing too much moisture from the mortar, and weakening the joints.

For maximum strength—and to get a water-tight bottom in the fish pond or pool—lay the first course of stones for the wall on the bottom of the excavation and build up from there.



Details of an overflow pipe for a built up pool.

Right now, it will be necessary to decide whether to build in an overflow pipe or not—it's purely optional. If it is decided to build in an overflow, use two lengths of 1″ galvanized pipe screwed into a galvanized elbow. Set one length of pipe on the stones in the wall at ground level, so that one end of the pipe is outside the wall and will drain on to the garden or lawn. Keep the other length of pipe upright, at least 1½″ away from the inside of the wall, with the end of the pipe about 1″ below the height of the top of the wall. Build the pipe into the wall in this position.

As the retaining wall is built to its full height, trim up the mortar joints on the outside of the stonework before the mortar sets. Don't worry about the inside joints because they will have to be rendered over later.

After building up the wall to the desired height, the next step is to concrete the bottom of the pool or fish pond. For a strong, water-tight job, use a mixture of 3 parts metal screenings to 2 parts sand and 1 part cement, and use about 4½ gallons of water to each bag of cement. Dampen the bottom of the pool before mixing the concrete, then pour the concrete into the bottom of the pool and spread it out with a rake or shovel to a depth of 3″. Tamp it down to consolidate it, then level it off with a short striker board or screed.

After this has been done, the inside of the retaining wall can be rendered with cement mortar. For this, use a mixture of 2 parts sand to 1 part of cement and keep the mixture fairly dry—only use about 4 gallons of water to each bag of cement. Give the inside of the wall a dampening first, then use a steel or wooden float to plaster the mortar on in a coat at least ½″ thick. Work from the bottom upwards and don't worry about floating the mortar to get an even finish.

For a good, water-tight job, three coats of mortar—each ½″ thick—are recommended. As each of the first two mortar coats are nearly dry, it is a good idea to roughen them up with a stiff yard broom. This will provide a good bond for the following coat of mortar, but remember to dampen each coat down before applying the next.

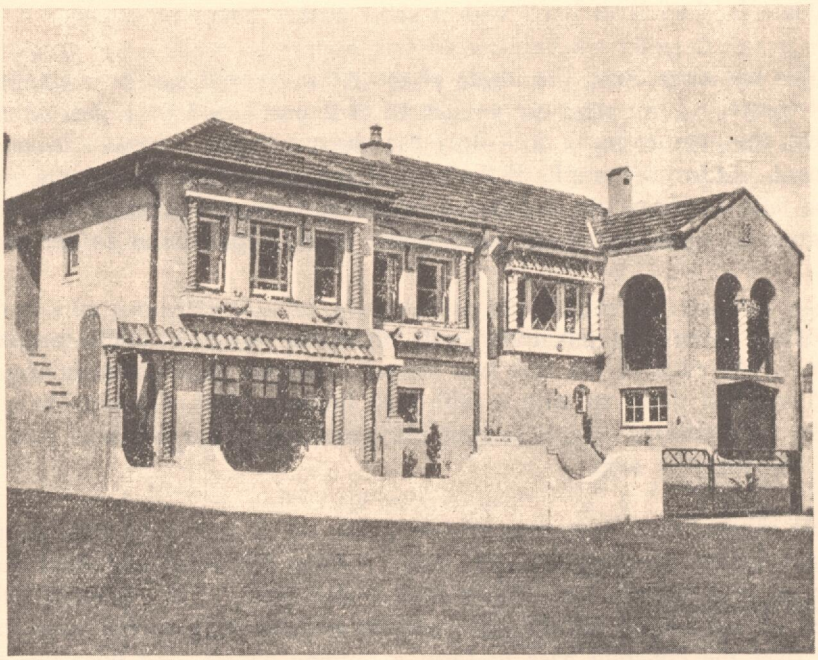
For best results, after each coat of mortar has set, it should be kept damp for two days before applying the next coat. Float the third and final coat of mortar up to a smooth, even finish with a steel float. If a smooth finish is required on the bottom of the fish pond or pool as well, spread some of the mortar over the concrete base to form a topping course, and float this up to a smooth finish too.

When the ornamental pool or fish pond has been finished off, it must be seasoned for one month before introducing any plant or fish life into it. During this period it should be emptied and re-filled several times. Each time it is emptied, thoroughly scrub the inside with an old scrubbing brush. This will get rid of any calcium salts deposit that might be brought to the surface of the concrete or mortar.

RENDERING A WALL WITH MORTAR

Plastering is one of the oldest arts. Its purpose—in early days—was that of filling the cracks in walls to make them weather-tight. The "wattle and daub," or mud plaster, of the ancient Britons is an example of this early use of plastering.

With the development of the art, its decorative possibilities became better known, and a popular demand for new and unusual effects has developed. These effects are almost invariably obtained by the special treatment of the final coat of mortar on any surface being plastered, but the method of applying the preliminary coat—or coats—of mortar is fairly constant for all types of plastering work.



A stately home finished in Spanish Texture stucco.

There are lots of folk with sufficient confidence in their own ability to tackle the laying of concrete drives and paths, and a number of other concreting jobs around home. There are many examples where this confidence has been well founded and a lot of the concreting and cementing jobs done by handymen would do credit to a first-class tradesman. But for some reason or other, there seem to be quite a few people who hesitate about tackling the rendering or plastering of a wall.

It is not suggested that this is the easiest of jobs for a beginner to start on—far from it. But for anyone who has had some experience and success with other concreting and cementing jobs, and for those who have developed some skill in using a float, it should not be too difficult to render a wall and make quite a tradesmanlike job of it.

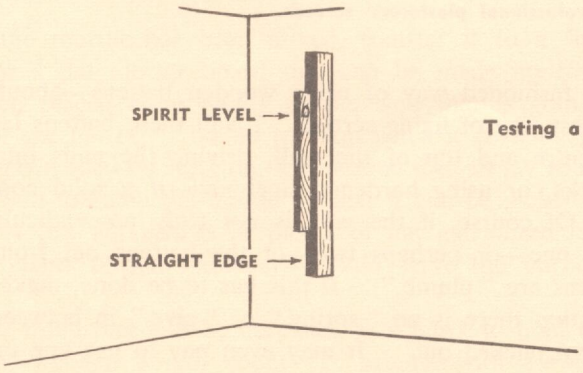
The first essential in producing a satisfactory job is to see that the surface to be rendered is in a proper condition to provide a good bond for the mortar. New walls of burnt clay or cement bricks are usually excellent bases for the direct application of mortar.

However, it is important to make sure that any surface to be rendered is rough enough to provide a good mechanical key, and to make sure that the surface is free from paint, oil, dirt or soot, or any material that might prevent a satisfactory bond.

This applies particularly to old masonry walls that may have been softened by weathering, and to walls that have been rendered previously. In the latter case, it is best to chip all the old mortar off, right back to the face of the wall. Then, in both cases, the wall surface should be thoroughly roughened. For this, the tradesman would probably use a bush hammer—a hammer with the faces covered by small pyramid-shaped protrusions which shatter and roughen the surface of the wall.

If a bush hammer is not available, it will be necessary to improvise by using an old tomahawk, or a hammer and cold chisel, to roughen up the surface of the wall. But be careful not to hit too hard, for this might crack and weaken the wall. With old masonry walls, it is a good idea to rake out the mortar joints between bricks to a depth of about ¼". This will provide a much better mechanical key for the mortar.

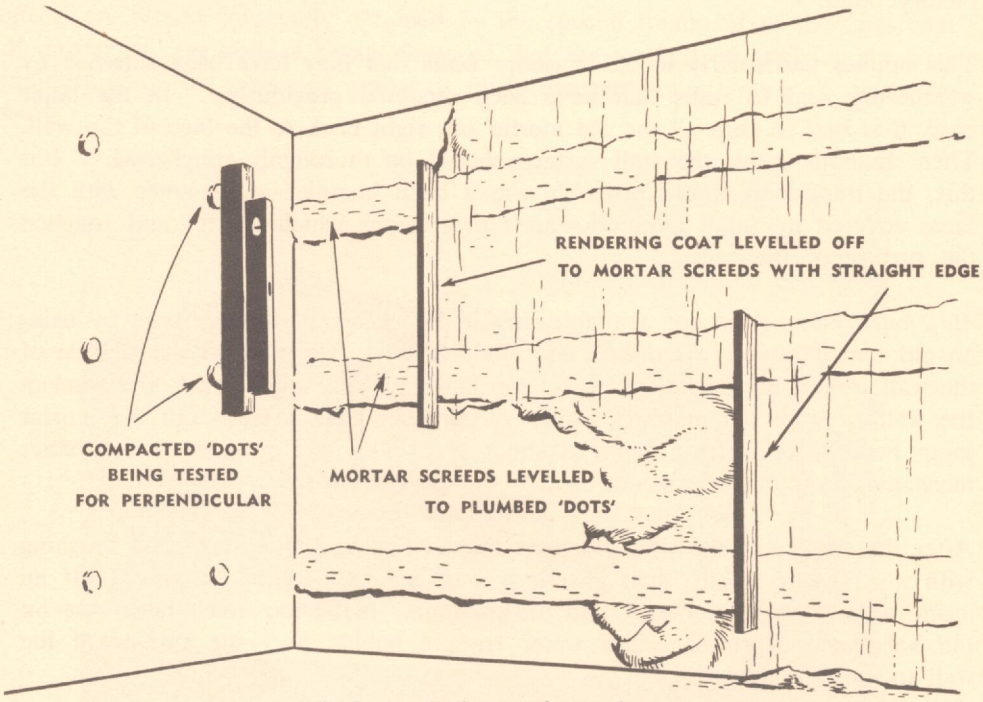
After the surface of the wall has been treated like this, give it a good brushing with a stiff wire brush, then give it a washing down with the hose. If an inside wall is being rendered, and the hose may make too much mess, use an old kalsomine brush to splash water from a bucket over the surface of the wall to clean it down.



Testing a wall for "plumb" or perpendicular.

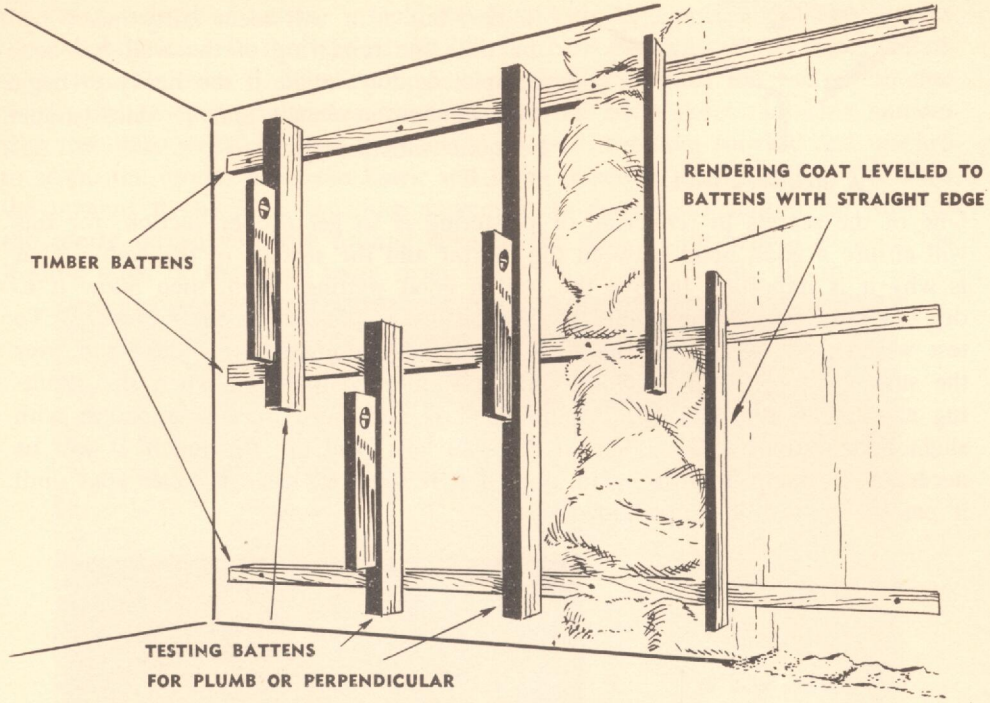
As it is desirable to get a perfectly flat rendered finish on the wall, at this stage it is wise to check to see that the wall itself is " plumb," or perpendicular. Do this by holding a straight edge vertically against the wall, with a spirit level held against the straight edge. If the wall is out of " plumb," it will be necessary to make allowance for this in fixing the levels for screeding.

Professional plasterers usually fix the screeds for a rendering coat by applying " dots "—or daubs of mortar—over the wall. These " dots " are set along the bottom, centre and top of the wall, at distances apart lengthwise that can be spanned by the straight edge. The " dots " are tested and compacted until they are all " plumb " at the thickness of the rendering coat. Then a screed —consisting of a strip of mortar about 6″ wide—is run lengthwise along the bottom, centre and top of the wall, and screeded off with the straight edge so that its surface is level with the plumbed " dots."



Professional plasterers' screeds.

But for amateurs, the old fashioned way of using wooden battens—about 1½″ wide by ½″ thick—is the best way of fixing screeds. Nail these battens lengthwise along the bottom, centre and top of the wall, driving the nails into the mortar joints between bricks, or using hardened steel nails if a solid concrete wall is being rendered. Of course, if the wall is not truly perpendicular, it will be necessary to pack one—or perhaps two—of the battens out from the wall, so that all three battens are " plumb." If this has to be done, make sure the battens are solid, and that there is no " spring " or " give " in between the points where they have been packed out. It may even pay to use one or two thicker battens if the wall is far enough out of true to warrant this.



Batten screeds.

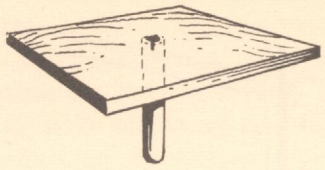
After the screeds have been fixed, give the wall a thorough wetting down with the hose or a kalsomine brush, and allow it to dry out until only a slight amount of moisture is present on the surface.

The mortar for the rendering coat can be mixed up while the wall is drying out. The method of doing this, and the proportions of the various materials to be used, are outlined in the section " How to mix mortar."

Don't mix up too much mortar at a time, for it is much better to use each batch before mixing up the next. And be careful not to make the mortar too wet.

When the mortar has been mixed, transfer it to a sheet of plain galvanized iron—or a flat mortar board that can be made up from scrap timber—which has been placed close handy to the wall that is going to be rendered. As some of the mortar is bound to drop when it is being plastered on to the wall, or being screeded off later on, it is a good idea to lay something along the bottom of the wall to catch the mortar so that it can be picked up easily and used over again. A few flat boards or pieces of flat galvanised iron—or even clean bags or old pieces of flat linoleum—should serve the purpose quite well.

Another thing that will be necessary is a hawk to hold the mortar. This hawk is a flat wooden board, about 12″ square, with a round handle fitted to the centre of the underneath side.

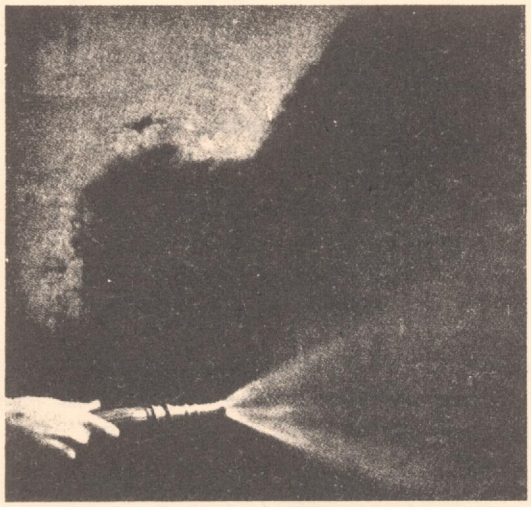


A plasterer's hawk.

It can be made up quite easily from scrap timber, but as it will seem fairly heavy by the time the rendering of the wall has been completed, don't make it too heavy to begin with. Timber between ½" and ¾" thick should be quite satisfactory.

One of the secrets in rendering or plastering is to get proper suction, for this will ensure a good bond between the mortar and the surface of the wall. That is why it is important to give the wall a good wetting down, then allow it to dry out until only a slight amount of moisture is present on the surface. To test whether the wall is at the right degree of dampness, draw the hand over the surface of the wall. Good suction should be obtained when the resulting amount of moisture left on the hand is not more than is apparent with slight perspiration. Of course, if the wall has dried out too much, it will be necessary to damp it down again, and, if it is too wet, leave it to dry out until it passes the test just mentioned.

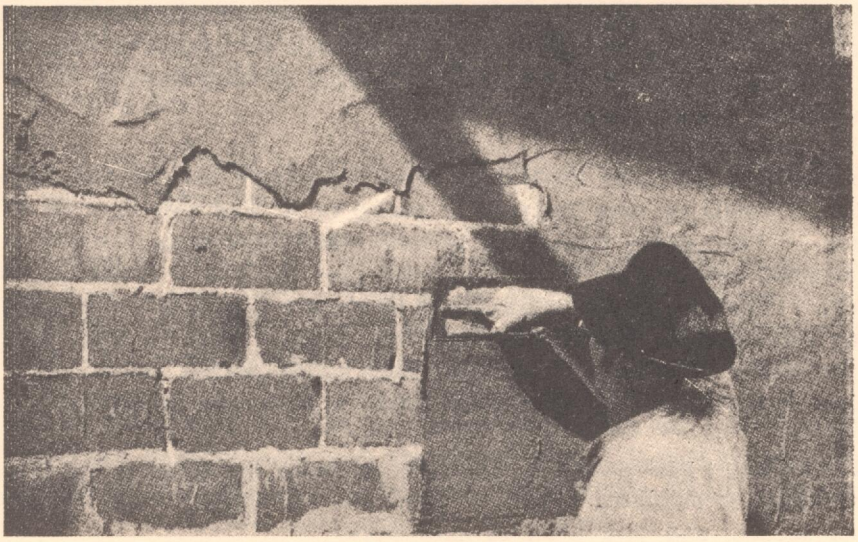
Keep the wall at the right degree of dampness to obtain proper suction.



Use a steel float to plaster the mortar on to the wall. Start off by holding the hawk as close as possible to the mortar that has already been placed on the mortar board, then use the steel float to scoop up mortar from the board on to the hawk. To begin with, don't try and get too much mortar on the hawk. It will be better to get the knack of using smaller amounts of mortar on the hawk before stepping up to the larger quantities that tradesmen seem to handle so easily. And keep the mortar heaped up in the centre of the hawk. That will make it easier to get the mortar on to the wall without dropping too much.

Probably the hardest thing of all to master in rendering a wall is to use the steel float to transfer the mortar from the hawk to the wall, and then spread the mortar fairly evenly over the wall. Co-ordinated wrist action, and plenty of practice, are the main secrets of success.

Start off by holding the hawk fairly close to the wall, about 18″ down from the centre screed or batten. Hold the float with its face at about right angles —or slightly less—to the face of the hawk. Now there are these three actions to perform at once. Tilt the hawk back slightly towards the body with one wrist—tilt the face of the float back towards the body about the same amount with the other wrist—and, at the same time, push the float forward and upward to scoop the mortar from the hawk and carry it across to the wall. Continue the upward stroke in a sweeping movement to spread the mortar up towards the centre screed with the trailing edge of the float. Be careful to keep the leading edge of the float away from the wall, or else it will dig in.



Applying a rendering coat of mortar to a wall.

Anyone who has never plastered a wall before is probably going to need some practice before mastering this art. So don't be afraid to take time out for practice until the knack is acquired. And don't worry about spilling a bit of mortar. Remember, there will be less mortar dropped as the technique is mastered, and anyway, the mortar can always be picked up and used over again.

When a bit of skill has been acquired, go ahead and plaster the wall to a width of 3′ or 4′, spreading the mortar ½″ thick. Then, do the same thing again, starting about 18″ lower down the wall, and working until the wall has been covered between the centre and bottom screeds to a width of 3′ or 4′. There is no need to be too fussy about the finish at this stage, because the surface has to be screeded off.

Now, run the straight edge over the screeds or battens to screed off the surplus mortar, using the straight edge with an up and down or sawing action as it is drawn along the battens. This screeding will roughen up the surface of the mortar, and any smooth patches will show where the mortar that has been spread with the steel float is lower than the screeds. Fill in any of these low spots and screed over them again until the surface of the mortar is perfectly level.

When the mortar begins to dry out and harden, it has to be floated up to a good, even finish. Use a wooden float for this, and, keeping the float flat on the mortar, rub it lightly over the surface with " figure 8 " or circular strokes. Fill in any small holes that may have been left in the surface after screeding, and remember—don't press the float down too hard ! The time it takes to spread and screed off the mortar will determine how much of the wall can be covered before using the wooden float to get a good, even finish. But, as a rule, the mortar should be ready for the final floating between a half to one hour after it has been plastered on the wall.

After the whole wall has been plastered and floated off like this, the wooden battens or screeds can be removed. The channels the battens or screeds have left should be filled in with mortar, then levelled off with the rest of the wall by using the wooden float.

After the wall has been finished off, and the mortar has set and began to harden, it should be kept damp for a period of at least two days for proper curing. This applies particularly to walls which have been plastered in hot, dry weather, and to walls which have been plastered with a mortar containing cement. The wall should be dampened by using a hose with a fine fog spray, taking care to avoid soaking the wall, and giving it only as much water as will be readily absorbed. After this damp curing process, each mortar coat should be allowed to dry thoroughly before a fresh coat is applied.

And don't forget that suction is absolutely necessary in making a first-class job of rendering or plastering a wall, so keep the wall damp enough to maintain proper suction, and save a lot of hard work.

HANDY HINTS

Removing Mortar from Brickwork.

Nothing looks more unsightly than mortar which remains on the face of brick or stone work after it has been laid. The mortar itself, or the stains that it leaves, can easily mar what would otherwise be classed as an excellent brick or stone laying job.

However, it is not difficult to remove the mortar—or the stains—from the face of the brick or stone work.

The first thing to do is to rub, scrape, or wire brush all of the excess mortar from the brick or stone work. Then put on a pair of rubber gloves to protect the hands and, using an old bucket, mix up one part of hydrochloric acid or spirits of salts in ten parts of water.

Use an old paint brush that can be thrown away when the job's finished to paint the brick or stone work with the diluted acid. It may be necessary to rub the acid in here and there, so be careful to keep the diluted acid mixture away from the hands, and away from the clothing too.

When applying the diluted acid mixture over the surface of the brick or stone work, take care to keep it away from the mortar joints between bricks and stones as much as possible. Allow the mixture to remain on the bricks or stones for 15 to 20 minutes, then wash it off thoroughly with the hose.

This should remove all of the unsightly mortar and stains from the face of the brick or stone work, and improve the appearance of the job considerably.

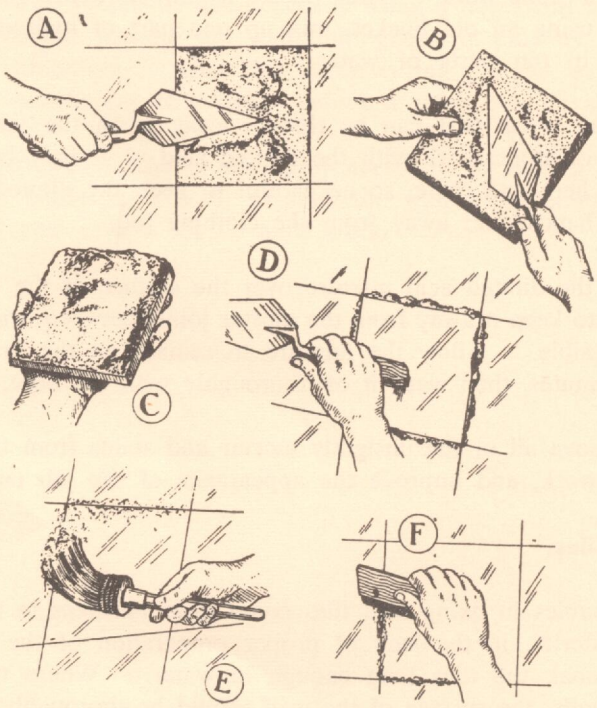
Fixing Wall Tiles.

Most of the troubles in fixing wall tiles come from mistakes in the mixture of the bedding material, in the lack of proper preparation of the wall surfaces, and failure to soak the tiles long enough in water. Where tiles are to be fixed to brick walls, the surface of the wall should be thoroughly cleaned down by scraping with a blunt trowel, or some other steel instrument. The mortar joints between bricks should be raked out for a depth of about ¼", and all loose particles cleaned off, using a stiff wire brush or bristle broom. The brick wall should be watered some time before commencing the tiling, and the wall should be thoroughly damp, but not running with a great amount of extra water.

On concrete walls or walls that have been plastered with cement mortar, clean the walls free from all dust and loose particles, and saturate them with clean water. Allow the excess water to penetrate or run off until the surface of the wall is slightly damp.

Use a mixture of 2 parts sand to 1 part of cement for the mortar in which to set the tiles. Never mix more mortar than can be used up within one hour because, by this time, the cement will begin to set. On concrete walls, or walls which have been rendered with cement mortar, the dampened wall surface should be hand dusted with neat cement prior to spreading the mortar on. This will ensure a good bond between the new and old surfaces.

Apply the cement mortar to the wall in a coat about ½" thick and spread uniformly over the area to be tiled. For larger areas, it may be necessary to set up screeds or battens as temporary guides, and use a straight edge to level the mortar off with the battens or screeds to obtain a setting bed of mortar which will be absolutely true and even.



A, thin coat of mortar in the vacancy. B, ditto on the tile. C, a stiffish mortar will not run off. D, tap the tile gently till level. E, brush off superfluous mortar with wet brush. F, clean off with piece of rubber and polish the whole surface.

Replacing a broken tile.

The bottom course of tiles should be fixed first. Each tile, after soaking in water, should have a thin coating of mortar spread uniformly on the back. The tile is then held carefully with the finger-tips, placed in position, and tapped gently with a wooden trowel handle until it is true to line and makes a flat surface with all other tiles. An amount of excess mortar will squeeze out at the top and side of each tile, and can be removed with the point of the trowel, a wet brush, or an old cloth. A flat piece of board, equal in area to about 4 or 5 tiles, should be placed over the tiles as they are laid, and the board gently tapped to bring all of the tiles to a uniform surface.

After the cement mortar bedding has set, clean down the face of the tiles, using a damp cloth or an old bag to remove all mortar. Do not leave this important operation until the next day, because the cement may set so hard that it will adhere to the thin film of glazing material in such a way that there is danger of damage being caused when it is chipped off.

Tiled surfaces should be hosed, or kept thoroughly wet, for several days to ensure best results. After damp curing for about a week, the tiled surfaces should be allowed to dry out slowly. The tiling should not be exposed to the effects of high temperature—as in a stove recess or fireplace—for three or four weeks after the job is finished. For earlier use than this, special bedding mixtures using rapid hardening cement—and possibly accelerators—would be required.

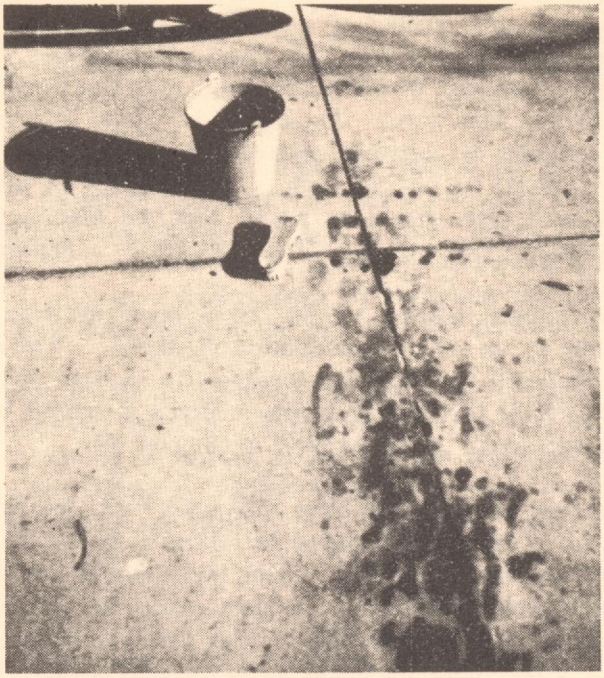
Removing Oil and Grease Stains from Concrete.

Good quality, dense concrete with a hardened surface is very easy to keep clean. But when concrete is dry and slightly porous, dirty oil and grease penetrates below the surface, and is sometimes difficult to clean away.

To remove oil and grease stains, sweep the concrete and then scrape away as much of the surface oil or grease as possible. Scrub the concrete with a strong solution of caustic soda in hot water. Be careful with the caustic soda when it is being dissolved and when it is being scrubbed over the stone, for it is liable to splash, and cause burns to the skin. Wash the concrete with plenty of clean water to remove all traces of the caustic soda, and, under average conditions, oil or grease stains will be removed.

Another alternative is to use an industrial grease remover instead of caustic soda. Some of these are quite inexpensive when purchased in 1 lb. tins.

One well-known brand consists of sodium metasilicate crystals and contains pine oil to give it a pleasant odour. As with the use of caustic soda, it is necessary to scrape any surface grease or oil from the concrete before using the sodium metasilicate type of cleaner. The same care must be taken to prevent the cleaner from coming in contact with the skin or clothing.



Another instance where prevention is better than cure.

After the surface grease or oil has been scraped from the concrete, wet the patch with water and sprinkle the sodium metasilicate crystals over it. Leave the crystals there for at least 10 to 15 minutes, then give the patch a good scrubbing with a stiff wire broom, or an old scrubbing brush. Finally, give the concrete a good wash over with plenty of clean water, or squirt it with a hose to remove all traces of the sodium metasilicate.

Always make sure that the tin containing the caustic soda or the sodium metasilicate is tightly sealed after use, and that it is kept out of reach of any small children. Unless the tin is tightly sealed, both substances will absorb moisture from the air, and form a solid mass that will be awkward to use if they are ever needed to clean the concrete again.

For any very old oil or grease stains that may remain after either of the two treatments mentioned, soak pieces of cloth in strong phenyl and lay these over the dirty patches. Spread flat pieces of tin or slate over the cloths and weigh them down with bricks. After 24 hours, the oil or grease stains should have disappeared. Wash the floor again to remove all traces of the phenyl then, while the floor is damp—but not too wet—sprinkle dry cement over the whole area. Spread this with a wide brush or soft hair broom to make an even appearance, and allow the cement to set hard for a few days if possible before use.

But of course, the best treatment for oil and grease staining is its complete prevention. Where this trouble is caused by oil or grease drips from a car, it is best to place a shallow iron tray or box—partly filled with sand—under the car to catch the oil or grease that drips from it, and protect the concrete in the garage floor or driveway.

Securing Timber, Plywood or Masonite to Concrete.

The most common way of securing timber, masonite or plywood to concrete is to drill a hole in the concrete, plug this, and secure the material to the concrete by means of a screw into the plug.

Although there are a number of ready-made, specially designed plugs which are much more satisfactory than the wooden plugs which were used exclusively in years past, it is still necessary to drill a hole in the concrete to take whichever form of plug is used.

One way to avoid this is to use specially hardened nails which can be driven straight through the material—and into the concrete—with an ordinary hammer. These nails are available in sizes from ½" to 3" in length, and the 1" size costs about £2 for a box of 100, or about 6d. each if less than a full box is purchased.

They do an excellent job and they won't bend. There is no drilling and no mess, and with a special tool, they can be driven into iron or steel.

In some cases where a perfectly flush finish is required, it may be necessary to drive the nail head down below the surface of the timber, plywood or masonite, and fill in around the nail heads with putty.

If masonite is being secured to concrete in this fashion, and it is desired to retain the natural finish of the masonite, a satisfactory putty can be made by melting down two parts of beeswax with one part of resin, and stirring in sufficient iron oxide powder to match the colour of the masonite. Let this mixture cool down and set before using it, then press it in around the nail heads, and smooth it off level with the surface of the masonite. A putty knife, or an old table knife, is handy for this.

Repairing Leaking Roofs.

Many corrugated galvanized iron roofs are built with such flat slopes that rain, driven by strong winds, sometimes penetrates under the lap of the sheets and drips inside. Such spaces in galvanized iron roofs —and even small holes —can be filled with a putty made from ordinary Portland Cement and linseed oil.

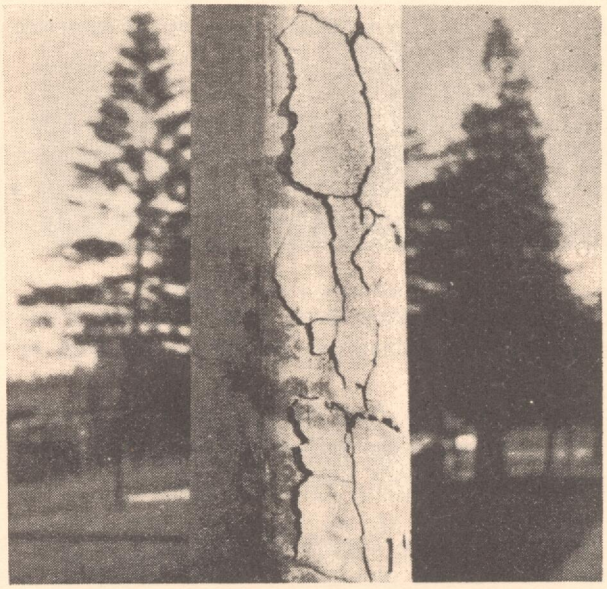
A convenient sized batch of cement putty can be made with 1 quart of boiled linseed oil and about 11 to 12 lbs. of cement. The putty will keep in good

condition for months if it is put into an air-tight tin, or sealed in some way to protect it from moist air.

If the sheets of galvanized iron are so tightly nailed that the cement putty cannot be worked in from the outside, make a stiff paint by slightly increasing the amount of boiled linseed oil. Apply this stiff paint with a brush from the inside or underside of the roof.

Reinforcing Concrete.

Steel reinforcement placed too near the surface of concrete is acted on by rain, or dampness in the air.



An example where reinforcement was placed too near the surface of a concrete pole.

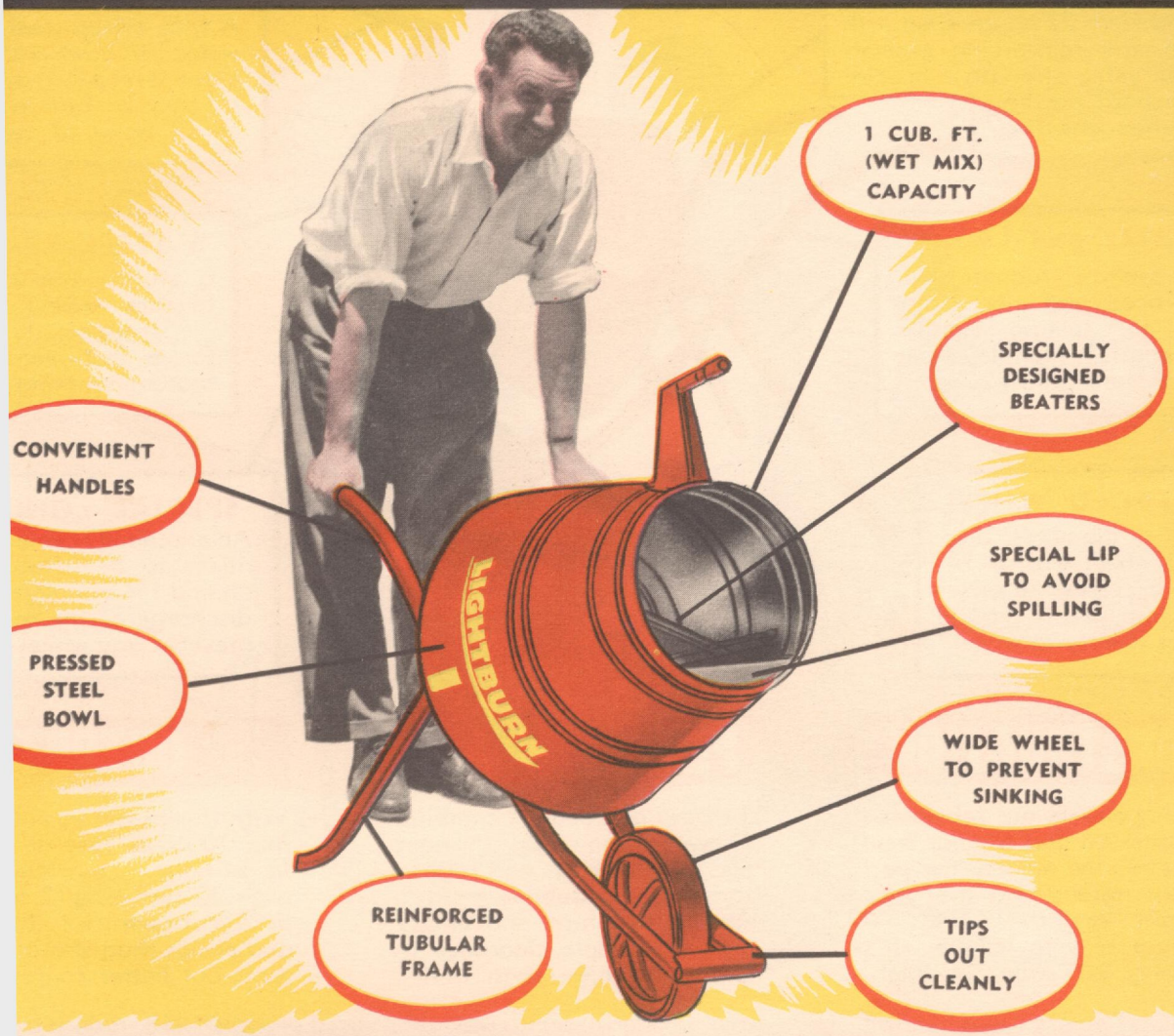
Rust forms from the iron with such force or pressure that the concrete cracks near the surface, and bursts off. This trouble is most difficult to cure.

Where concrete is exposed to the weather, any iron or steel reinforcement used in it should be buried at least ½" or more from the surface of the concrete which is exposed to the weather.

NOTES

NOTES

LIGHTBURN 1 c.ft. Mixer



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This sturdy model is a mixer and wheelbarrow combined and eliminates all double handling. It is built entirely of steel — has no castings to break — and will last a lifetime. It gives a faster, easier, better mix that will save you time, money and hard work on every mixing job!

IT'S IDEAL FOR

Mixing concrete for foundations, floors, paths, lintels, verandahs and porches!
Mixing aggregate for making bricks, blocks, slabs—repairing tanks and troughs!
Building garages, walls, barbecues, window boxes, wading pools and fish ponds!
Mixing lime and cement mortars for bricklaying and floating or rendering coats!
Mixing fertilizer, manure, soil, seed, sprays, compost—bird and poultry food!
Making garden ornaments, bird baths, seats, flower boxes, rockeries, fence posts!

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Here's why the LIGHTBURN 1c.ft. M is the best Mixer for the handyman!

PRESSED STEEL BOWL

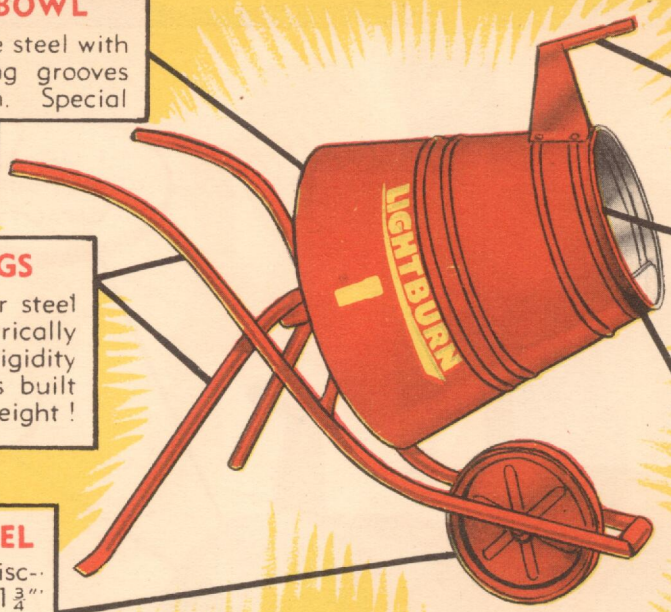
Fabricated from 22 gauge steel with rolled lip and reinforcing grooves to provide extra strength. Special lip inside bowl prevents spillage when wheeling!

FRAME and LEGS

Formed from $\frac{7}{8}$" tubular steel . . . braced and electrically welded for lasting rigidity and strength. Handles built to convenient working height!

WIDE FACED WHEEL

Sturdy, $10\frac{5}{8}$" diameter, disc-type steel wheel with a $1\frac{3}{4}$" wide face prevents the mixer from sinking in soft ground . . . makes it easy to wheel!



BOWL HAND

A wide-sweep steel h welded to bowl and g extra leverage that n so easy to turn a f of all types of aggr

6 STEEL BEAT

6 sturdy, pressed beaters welded to . . . strategically p for a fast, contin thorough mixing ac

SPECIAL LONG

An extended nose ena mixer to be lifted r on end for complete a discharge of the mix prevents any wheel-cl

CONSTRUCTION

All components are fabricated from pressed and tubular steel —electrically welded for permanent rigidity and strength! Its light weight — 42 lbs. — makes it easy to handle. It's 44" long, 26" wide, 34" high.

PERFORMANCE

The bowl and beaters combine to give a thorough, stronger mix . . . wide legs and rugged frame give stability! It's easy to fill, turn and empty . . . with ample clearance to tip into average form work!

OUTPUT

With this model you can mix 10 cubic feet of co in an hour . . sufficient path 20 feet long, 2 fee by 3 inches thick! It's and easier than shovel m turns out better concrete

LIGHTBURN'S engineering "know how," modern techniques, specialised plant, skilled tradesmen a rigid inspection combine to produce a unit which will mix quickly, easily, efficiently . . . a u which is strong, rigid and will stand up to a lifetime of hard work with minimum wear . . . a mix which is fully guaranteed . . and supported by a Service and Spare Parts set-up in your own Stat

$1\frac{1}{4}$ C. Ft. MIXER Stand Type Hand Operated	$1\frac{1}{2}$ C. Ft. MIXER Barrow Type Hand Operated	$1\frac{3}{4}$ C. Ft. MIXER Stand Type Hand or Power Operated
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"Wide Sweep" Bowl Handle for easy turning
1¼ C.Ft. capacity Bowl with Rolled Lip for added strength
Special Reinforcing Grooves give Bowl strength and rigidity
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Rubber Hand Grip protects hand when emptying
Pressed steel Tip Bracket locks Bowl when emptying
Sturdy, tubular steel Frame and Legs
Widely spaced Legs for complete stability
LIGHTBURN
MADE IN AUSTRALIA BY LIGHTBURN & CO. LIMITED

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If you have a wheelbarrow . . and need a low priced, hand operated mixer . . this sturdy model is your best buy! Its tubular and pressed steel design combines strength with light weight. It mixes speedily and efficiently . . . is easy to fill . . . easy to turn . . . and easy to empty!

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Mixing aggregate for making bricks, blocks, slabs—repairing tanks and troughs!
Building garages, walls, barbecues, window boxes, wading pools and fish ponds!
Mixing lime and cement mortars for bricklaying and floating or rendering coats!
Mixing fertilizer, manure, soil, seed, sprays, compost—bird and poultry food!
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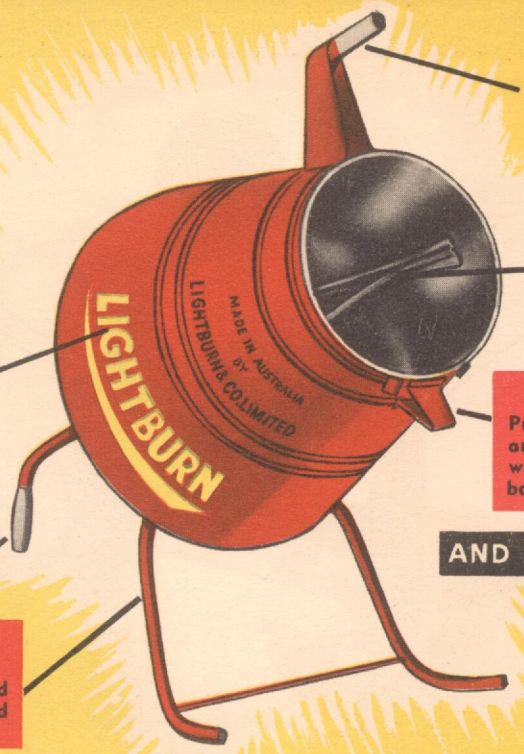
Here's why the LIGHTBURN 1¼cft. M is the best Mixer for the handyman!

IT MIXES LIKE THIS



BOWL HANDLE.
"Wide-sweep" bowl handle is welded to bowl to give extra leverage that makes this mixer easy to turn.

6 STEEL BEATERS.
Six specially designed, strategically placed, pressed steel beaters give a fast, efficient continuous mixing action.

TIP BRACKET.
Pressed steel tip bracket and "anti-roll" stops are welded to bowl to prevent bowl moving when emptying!

PRESSED STEEL BOWL.
Fabricated from 22 gauge steel with rolled lip and reinforcing grooves that provide added strength.

FRAME and LEGS.
Formed from ⅞" tubular steel braced and electrically welded to give permanent rigidity and strength.

AND EMPTIES LIKE THIS

CONSTRUCTION

All components are fabricated from pressed and tubular steel —electrically welded for permanent rigidity and strength! Its light weight — 29 lbs. — makes it easy to handle. It's 44" long, 21½" wide, 32" high.

PERFORMANCE

This mixer is easy to fill . . . easy to turn . . easy to empty! Six specially designed beaters give fast, efficient mixing . . wide legs and long frame give stability . . tip bracket locks bowl on barrow when emptying.

OUTPUT

With this model, you can mix 12½ cubic feet of con in an hour . . . sufficient path 25 feet long, 2 feet by 3 inches thick! It's and easier than shovel mix turns out better concrete

LIGHTBURN'S engineering "know how," modern techniques, specialised plant, skilled tradesmen and rigid inspection combine to produce a unit which will mix quickly, easily, efficiently . . . a unit which is strong, rigid and will stand up to a lifetime of hard work with minimum wear . . . a mixer which is fully guaranteed . . and supported by a Service and Spare Parts set-up in your own State

LOOK at these other LIGHTBURN Models you can choose from!

1 C. Ft. MIXER Barrow Type Hand Operated	1½ C. Ft. MIXER Barrow Type Hand Operated	1¾ C. Ft. MIXER Stand Type Hand or Power Operated
2 C. Ft. MIXER Trailer Type Hand or Power Operated	3 C. Ft. MIXER Trailer Type Power Operated	3½ C. Ft. MIXER Trailer Type Power Operated

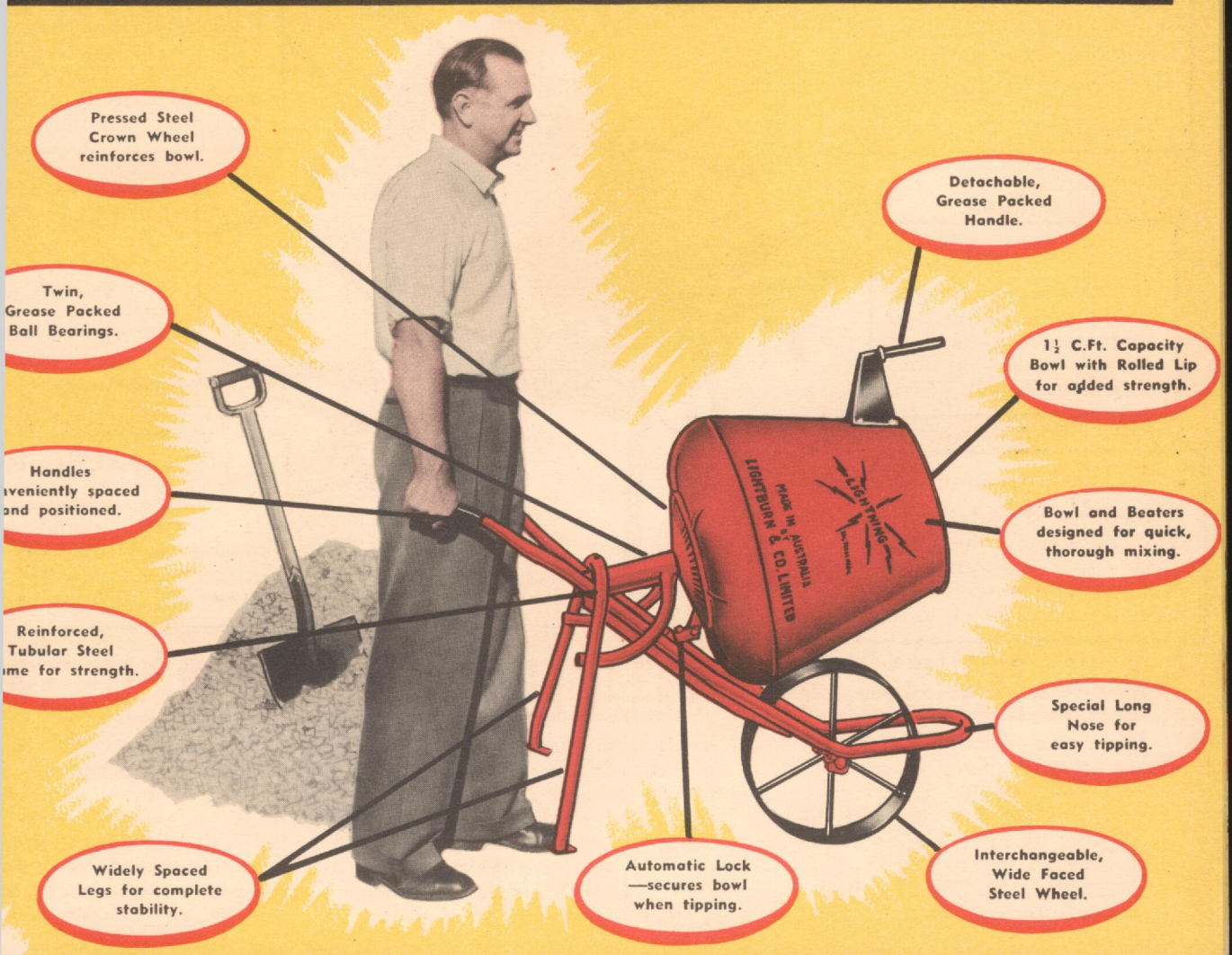
AVAILABLE FROM

LIGHTBURN & CO. LIMITED

The Concrete Mixer People of Australia!

CNR. GREY & PEEL STS., STH. BRISBANE 4 1361 | 132 STANMORE ROAD, STANMORE, N.S.W. 56 6351 | 404 ELIZABETH STREET, MELBOURNE 34 4618 | MORPHETT ROAD, CAMDEN S.A. 9 4193 | 396 MURRAY STREET, PERTH 23 1351

e "LIGHTNING" 1½ c.ft. Mixer


Pressed Steel Crown Wheel reinforces bowl.
Twin, Grease Packed Ball Bearings.
Handles ıveniently spaced ınd positioned.
Reinforced, Tubular Steel ıme for strength.
Widely Spaced Legs for complete stability.
Automatic Lock —secures bowl when tipping.
Detachable, Grease Packed Handle.
1½ C.Ft. Capacity Bowl with Rolled Lip for added strength.
Bowl and Beaters designed for quick, thorough mixing.
Special Long Nose for easy tipping.
Interchangeable, Wide Faced Steel Wheel.
LIGHTNING
MADE IN AUSTRALIA
LIGHTBURN & CO. LIMITED

... a HANDYMAN'S MIXER and WHEELBARROW COMBINED!

You can wheel this rugged, hand operated model to your sand and metal . . mix in it . . wheel the mix to your job . . eliminating all double handling ! The bowl runs on two ball bearings . . it mixes quickly, easily, efficiently . . is perfectly balanced for wheeling and tipping !

IT'S IDEAL FOR

Mixing concrete for foundations, floors, paths, lintels, verandahs and porches !
Mixing aggregate for making bricks, blocks, slabs—repairing tanks and troughs !
Building garages, walls, barbecues, window boxes, wading pools and fish ponds !
Mixing lime and cement mortars for bricklaying and floating or rendering coats !
Mixing fertilizer, manure, soil, seed, sprays, compost—bird and poultry food !
Making garden ornaments, bird baths, seats, flower boxes, rockeries, fence posts !

Look for this Emblem ANOTHER LIGHTBURN PRODUCT *it's more than a name ... it's a guarantee*

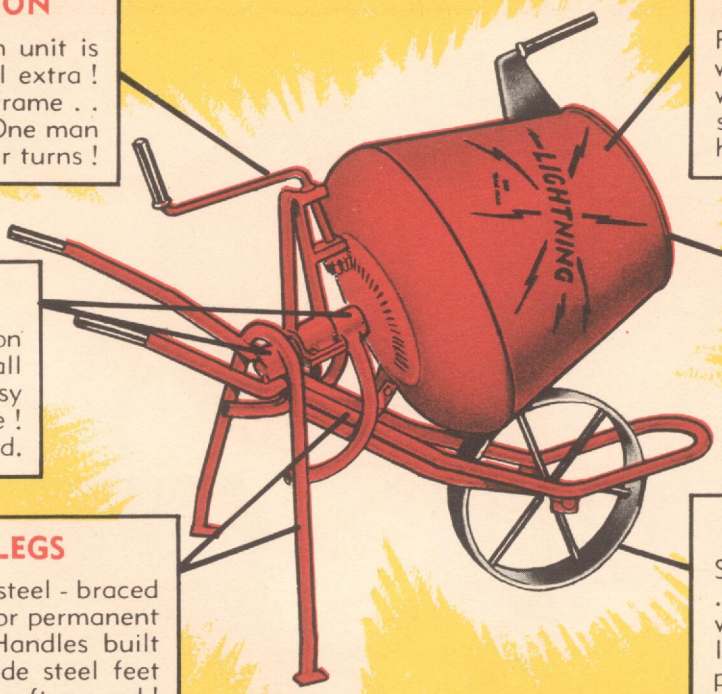
Here's why the "LIGHTNING" 1½ c.ft. Mix is the best Mixer for the handyman!

GEAR REDUCTION

A 5 to 1 gear reduction unit is available as an optional extra! It clamps to the mixer frame . . makes turning easier. One man can load bowl as another turns!

PRESSED STEEL BO

Fabricated from 18 gauge with inbuilt reinforcing wheel and rolled lip for strength! Double welded high grade steel bowl spi



BEARINGS

The bowl spindle runs on twin, grease packed ball bearings . . . giving easy operation and long life! A bearing cap is fitted.

5 STEEL BEA

5 sturdy, 1¼" x steel beaters wel bowl . . . scient placed for fast, ent, continuous m

FRAME and LEGS

Formed from 1" tubular steel - braced and electrically welded for permanent rigidity and strength. Handles built to convenient height, wide steel feet prevent mixer sinking in soft ground!

WIDE FACED WI

Sturdy, 15½" diameter ste . . 3" wide cambered rim wheeling over all type of Interchangeable with a 4 pneumatic tyred industri

CONSTRUCTION

Here's a mixer which will stand up to years of hard work! Its all - steel, welded construction gives lasting strength and rigidity . . its light weight makes it easy to handle. It is 52½" long, 28½" wide and 37½" high - and weighs just under 75 lbs.!

PERFORMANCE

The bowl and beaters combine to give a thorough, stronger mix - lots faster and easier than the old, back-breaking method too! Weight is distributed over the wheel for easy handling . . easy emptying - with ample clearance to tip into average form work!

OUTPUT

When operated by one ma mixer will produce 15 c. thoroughly mixed concrete hour . . . enough concrete path 30 feet long, 2 feet 3 inches thick! With the reduction, two men can tu 30 c.ft. of concrete per

LIGHTBURN'S engineering "know how," modern techniques, specialised plant, skilled tradesmen a rigid inspection combine to produce a unit which will mix quickly, easily, efficiently . . . a u which is strong, rigid and will stand up to a lifetime of hard work with minimum wear . . . a mix which is fully guaranteed . . and supported by a Service and Spare Parts set-up in your own Stat

LOOK at these other "LIGHTNING" Models you can choose from!

AVAILABLE FRO

1 C. Ft. MIXER Barrow Type Hand Operated	**1¾ C. Ft. MIXER** Stand Type Hand or Power Operated	**3 C. Ft. MIXER** Trailer Type Power Operated
1¼ C. Ft. MIXER Stand Type Hand Operated	**2 C. Ft. MIXER** Trailer Type Hand or Power Operated	**3½ C. Ft. MIXER** Trailer Type Power Operated

LIGHTBURN & CO. LIMITED

The Concrete Mixer People of Australia!

CNR. GREY & PEEL STS., STH. BRISBANE 4.1361 | 132 STANMORE ROAD, STANMORE N.S.W. 56.6351 | 404 ELIZABETH STREET, MELBOURNE 34.4618 | MORPHETT ROAD, CAMDEN S.A. 9.4193 | 396 MURRAY STREET, PERTH 23.1351

LIGHTBURN 1¾ c.ft. Mixer

- Convenient Tip Handle for Quick Easy Emptying
- Alternate Mixing osition for Wet or Dry Mixtures
- Fabricated Tubular Steel Tip Arm for trength and Balance
- Tubular Steel Frame for Permanent Rigidity and Srength
- Available Complete with ½ H.P. Electric Motor and Mounting
- 1¾ c.ft. Capacity Bowl with Rolled Lip For Added Strength
- Bowl and Beaters Designed for Quick Thorough Mixing
- Silent 'V' Belt and Pulley Drive for Power Operation
- Safety Guards For Power Driven Belts and Pulleys
- Engine or Motor Cover for Full Protection
- Available Complete with 1 H.P. Petrol Engine and Mounting
- Mounted on Steel Wheels for Complete Mobility

...the HANDYMAN'S MIXER for HAND or POWER OPERATION!

You can buy it for hand operation . . convert to petrol engine or electric motor drive later if you wish . . or buy it complete with engine or motor ! It's designed to mix all types of aggregate quickly, thoroughly, without hard work . . built for years of trouble-free service !

IT'S IDEAL FOR

Mixing concrete for foundations, floors, paths, lintels, verandahs and porches !
Mixing aggregate for making bricks, blocks, slabs—repairing tanks and troughs !
Building garages, walls, barbecues, window boxes, wading pools and fish ponds !
Mixing lime and cement mortars for bricklaying and floating or rendering coats !
Mixing fertilizer, manure, soil, seed, sprays, compost—bird and poultry food !
Making garden ornaments, bird baths, seats, flower boxes, rockeries, fence posts !

Look for this Emblem ANOTHER LIGHTBURN PRODUCT *it's more than a name ... it's a guarantee*

Here's why the LIGHTBURN 1¾ cft. Mix is the best Mixer for the handyman!

CONSTRUCTION

FRAME. 1" and ¾" tubular steel, reinforced and welded to provide rugged stability and long life!
TIP ARM. Fabricated from ¾" tubular steel for strength—has balanced action for easy handling!
BOWL. Formed from 18 gauge steel with inbuilt, reinforcing crown wheel . . welded to 1⅛" spindle!
BEATERS. Five 1¼" flat steel beaters give the thorough, speedy mixing action . . a stronger mix!
BEARINGS. Wide surfaced, fully lubricated cast bearings fitted to bowl spindle and pinion shaft!
TRANSMISSION. "V" belt between power unit and pinion shaft—crown wheel and pinion drive bowl!

PERFORMANCE

This sturdy handyman model makes every mixing job easy! It has a convenient loading height, mixes speedily and efficiently, has a simple, perfectly balanced tipping action and empties the whole mix out cleanly . . all without hard work! It has two mixing positions—for wet or dry mixtures—wide faced wheels for complete mobility, a silent "V" belt drive that keeps wear down to a minimum when power operated! And . . . it's priced to suit you!

OUTPUT

Mixes 47 cubic feet of thoroughly mixed concrete in an hour when power driven . . enough for a path 63 feet long, 3 feet wide by 3 inches thick! One man, operating this mixer by hand, can produce 18 cubic feet of concrete per hour—lots faster and easier than shovel mixing—get a better job too!

LOOK at these other LIGHTBURN Models you can choose from

1 C. Ft. MIXER
Barrow Type
Hand Operated

1¼ C. Ft. MIXER
Stand Type
Hand Operated

1½ C. Ft. MIXER
Barrow Type
Hand Operated

2 C. Ft. MIXER
Trailer Type
Hand or Power Operated

3 C. Ft. MIXER
Trailer Type
Power Operated

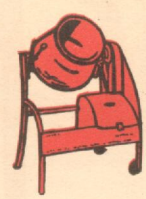
3½ C. Ft. MIXER
Trailer Type
Power Operated

..and you can buy it like THIS by asking for THI

Mixer only with inbuilt gear reduction and handle for hand operation. Mounted on steel wheels!
CATALO NUMBE 135 and 136

Mixer supplied with mounting for engine . . including engine fitting, cover, "V" belts and pulleys!
CATALO NUMBE 135 and 134

Mixer supplied with mounting for motor . . . including motor fitting, cover, "V" belts and pulleys!
CATALO NUMBE 135 and 131


Mixer complete with engine mounting & popular, 1 HP., air cooled, four stroke petrol engine!
CATALO NUMB 135 134 and 133

Mixer complete with motor mounting & ¼ HP., single phase, 240 V. AC. electric motor!
CATALO NUMB 135 134 and 132

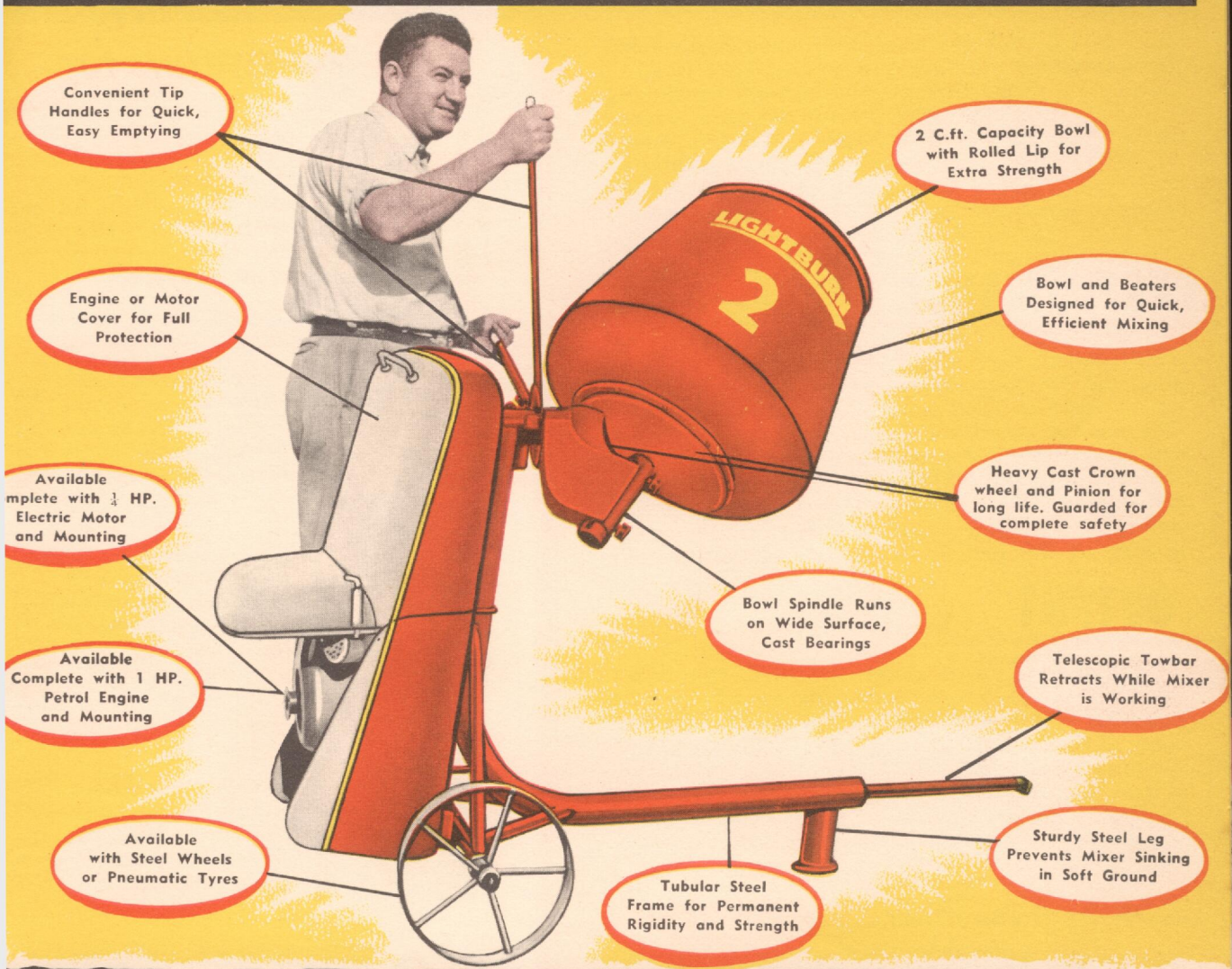
AVAILABLE FROM

LIGHTBURN & CO. LIMITED

The Concrete Mixer People of Australia!

CNR. GREY & PEEL STS., STH. BRISBANE 4 1361 | 132 STANMORE ROAD, STANMORE, N.S.W. 56 6351 | 404 ELIZABETH STREET, MELBOURNE 34 4618 | MORPHETT ROAD, CAMDEN S.A. 9 4193 | 396 MURRAY STREET, PERTH 23 1351

LIGHTBURN 2 c.ft. Mixer


Convenient Tip Handles for Quick, Easy Emptying
2 C.ft. Capacity Bowl with Rolled Lip for Extra Strength
Engine or Motor Cover for Full Protection
Bowl and Beaters Designed for Quick, Efficient Mixing
Available mplete with ¼ HP. Electric Motor and Mounting
Heavy Cast Crown wheel and Pinion for long life. Guarded for complete safety
Bowl Spindle Runs on Wide Surface, Cast Bearings
Available Complete with 1 HP. Petrol Engine and Mounting
Telescopic Towbar Retracts While Mixer is Working
Available with Steel Wheels or Pneumatic Tyres
Sturdy Steel Leg Prevents Mixer Sinking in Soft Ground
Tubular Steel Frame for Permanent Rigidity and Strength
LIGHTBURN
2

...a MULTI-POWER MIXER you can drive 6 DIFFERENT WAYS

You can drive it with a ¼ HP. electric motor or 1 HP. petrol engine . . a tractor pulley or any stationary engine . . an overhead pulley . . or turn it by hand! It's strongly made for towing behind tractor, truck or car . . yet it's light and well balanced for easy wheeling!

IT'S IDEAL FOR

Builders—in mixing concrete for foundations, floors, lintels . . for mortar too!
Plasterers—for mixing cement and lime mortars for floating and rendering coats!
Paving Contractors—in mixing concrete for paths, floors, verandahs and porches!
Industrialists—for factory maintenance . . process mixing . . and rumbling parts!
Cement Product Manufacturers—in making bricks, slabs, tiles, cisterns, troughs!
Agriculturalists—for mixing fertilizer, seed . . making concrete troughs, posts!

Look for this Emblem ANOTHER LIGHTBURN PRODUCT *it's more than a name ... it's a guarantee*

Here's why the LIGHTBURN 2 c.ft. Mix is the best Mixer for your job!

CONSTRUCTION

FRAME. 2" tubular steel, reinforced and welded for permanent rigidity, strength . . light weight!
TIP ARM. Fabricated steel to prevent breakage!
BOWL. 18 G. steel with reinforced base, welded to 1⅛" bowl spindle. Has heavy cast crown wheel!
BEATERS. 1¼" x 3/16" steel . . give thorough mix!
BEARINGS. Bowl spindle and drive shaft run on wide-surfaced cast bearings . . to minimise wear!
WHEELS. 12" steel, wide face—or 8" pneumatic!

PERFORMANCE

This rugged, lightweight, well balanced model is designed for quick, thorough mixing . . . to stand up to years of hard work. It's easy to use too! The bowl is set at a convenient loading height—the tip handles give an easy, positive control—the mix empties out cleanly! A silent, quickly adjustable "V" belt drive is employed for power operation . . . wide wheels and leg prevent mixer sinking in soft ground—make it easy to handle!

OUTPUT

In actual tests, when power operated, this mixer produced 2 c. yds. of thoroughly mixed concrete per hour . . . enough concrete for a path 108 feet long, 2 feet wide, 3 inches thick! Under normal working conditions, it will mix 16 c. yds. in an 8 hour working day. One man, turning this mixer by hand, can mix a 2 c. ft. batch of concrete in 2 minutes . . and get a stronger, quicker, easier mix than by the old back-breaking shovel method!

LOOK at these other LIGHTBURN Models you can choose from

1 C. Ft. MIXER
Barrow Type
Hand Operated

1¼ C. Ft. MIXER
Stand Type
Hand Operated

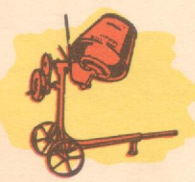
1½ C. Ft. MIXER
Barrow Type
Hand Operated

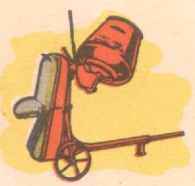
1¾ C. Ft. MIXER
Stand Type
Hand or Power Operated

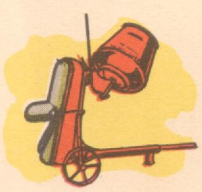
3 C. Ft. MIXER
Trailer Type
Power Operated

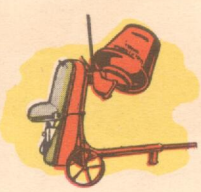
3½ C. Ft. MIXER
Trailer Type
Power Operated

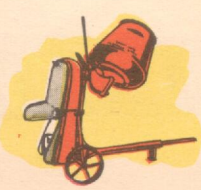
..and you can buy it like THIS by asking for THIS


Mixer only with "V" belt & pulleys for inbuilt gear reduction! Mounted on steel wheels!
CATALOG NUMBER 180


Mixer supplied with mounting for engine . . . including engine fitting, cover, "V" belt and pulley!
CATALOG NUMBER 180 and 179


Mixer supplied with mounting for motor . . . including motor fitting, cover, "V" belt and pulley!
CATALOG NUMBER 18 and 17


Mixer complete with engine mounting & popular, 1 HP., air cooled, four stroke petrol engine!
CATALOG NUMBER 18 17 and 17


Mixer complete with motor mounting & ¼ HP., single phase, 240 V. AC. electric motor!
CATALOG NUMBER 18 17 and 17

SPECIFY PNEUMATIC TYRED WHEELS IF REQUIRED

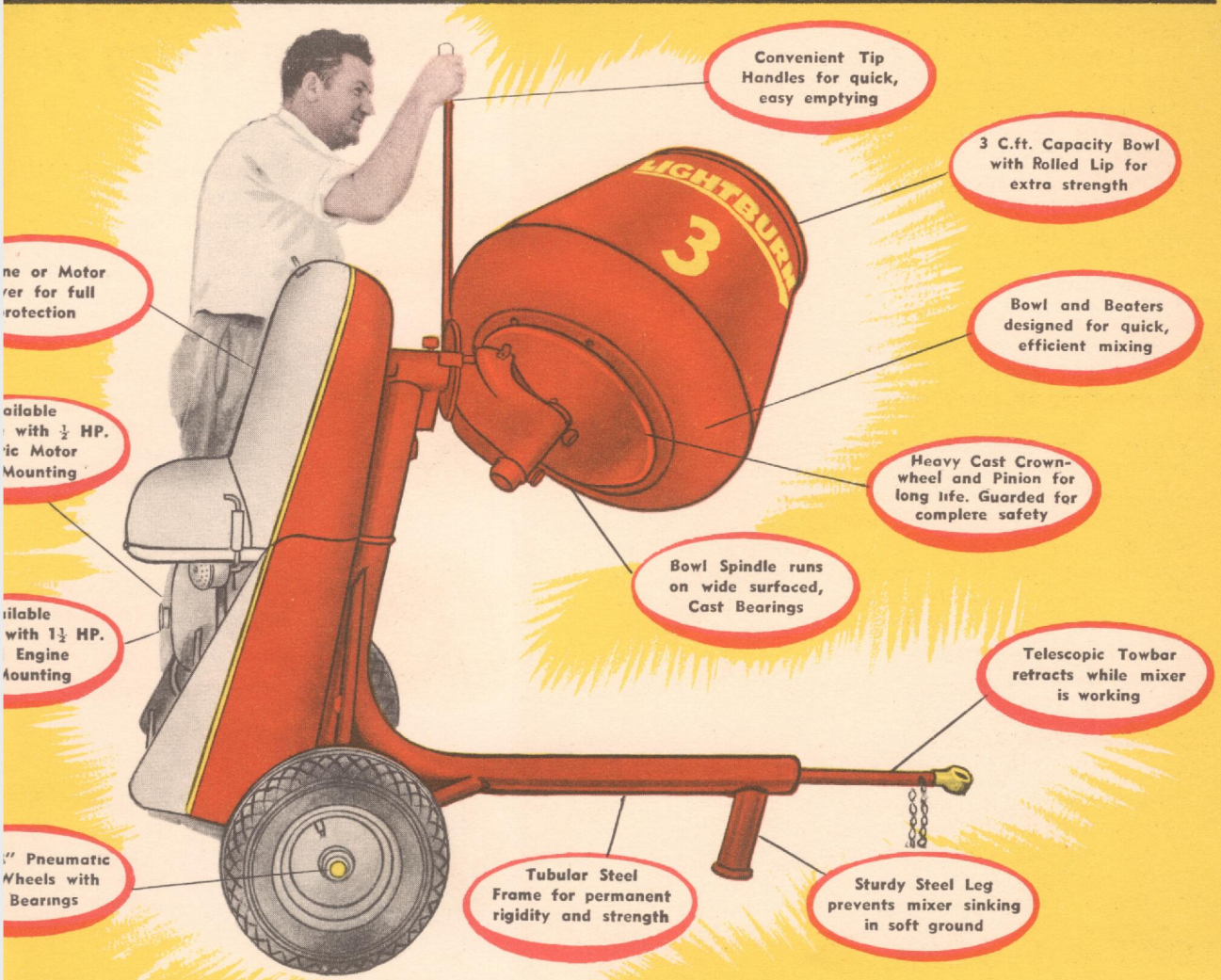
AVAILABLE FROM

LIGHTBURN & CO. LIMITED

The Concrete Mixer People of Australia!

CNR. GREY & PEEL STS., STH. BRISBANE 4 1361
132 STANMORE ROAD, STANMORE, N.S.W. 56 6351
404 ELIZABETH STREET, MELBOURNE 34 4618
MORPHETT ROAD, CAMDEN S.A. 9 4193
396 MURRAY STREET, PERTH 23 1351

LIGHTBURN 3 c.ft. Mixer


Convenient Tip Handles for quick, easy emptying
3 C.ft. Capacity Bowl with Rolled Lip for extra strength
ne or Motor
er for full
rotection
Bowl and Beaters designed for quick, efficient mixing
ailable
with ½ HP.
ic Motor
Mounting
Heavy Cast Crown-wheel and Pinion for long life. Guarded for complete safety
Bowl Spindle runs on wide surfaced, Cast Bearings
ilable
with 1½ HP.
Engine
Mounting
Telescopic Towbar retracts while mixer is working
" Pneumatic
Wheels with
Bearings
Tubular Steel Frame for permanent rigidity and strength
Sturdy Steel Leg prevents mixer sinking in soft ground
LIGHTBURN
3

RUGGED, MOBILE POWER MIXER for the TRADESMAN!

Designed for fast, efficient mixing . . . safe, speedy towing . . . and built to give years of trouble-free service! It handles easily and gives a high output . . . is powered by a 1½ HP. petrol engine or ½ HP. electric motor. Available with or without power unit and mounting!

T'S
DEAL
OR

Builders—in mixing concrete for foundations, floors, lintels . . for mortar too!
Plasterers—for mixing cement and lime mortars for floating and rendering coats!
Paving Contractors—in mixing concrete for paths, floors, verandahs and porches!
Industrialists—for factory maintenance . . process mixing . . and rumbling parts!
Cement Product Manufacturers—in making bricks, slabs, tiles, cisterns, troughs!
Agriculturalists—for mixing fertilizer, seed . . making concrete troughs, posts!

Look for this Emblem ANOTHER LIGHTBURN PRODUCT *it's more than a name ... it's a guarantee*

Here's why the LIGHTBURN 3 c.ft. Mi

is the best Mixer for the tradesman!

CONSTRUCTION

BOWL. 16 G. steel with reinforced base — welded to 1¼" bowl spindle. Has heavy, cast crown wheel!
BEATERS. Nine 1¼" flat steel beaters give the thorough, speedy mixing action . . . a stronger mix!
TIP ARM. Fabricated steel, to prevent breakage!
FRAME. 3" tubular steel – reinforced and welded for permanent rigidity, strength and light weight!
BEARINGS. Wide surfaced, fully lubricated cast bearings fitted to bowl spindle and pinion shaft!
WHEELS. 8" pneumatic – with twin ball bearings!
TRANSMISSION. Triple "V" belts between power unit and pinion shaft — heavy pinion drives bowl!

PERFORMANCE

With a fast, efficient mixing action and complete mobility, this sturdy model saves time — and hard work—on every mixing job! It has a convenient loading height, perfectly balanced tipping action, and empties the whole mix out cleanly. A silent, quickly adjustable "V" belt drive keeps wear down to a minimum. Guards enclose power unit, pulleys, belts, crown wheel and pinion for complete safety! Built and balanced for easy handling by one man!

OUTPUT

This mixer will produce 3 cubic feet of thoroughly mixed concrete or mortar in 2 minutes—or 3 cubic yards per hour! Under normal working conditions, it will mix sufficient concrete for the foundation of an average home in less than a day . . . and give a stronger, longer lasting job—much easier too!

LOOK at these other LIGHTBURN Models you can choose from

1 C. Ft. MIXER
Barrow Type
Hand Operated

1¼ C. Ft. MIXER
Stand Type
Hand Operated

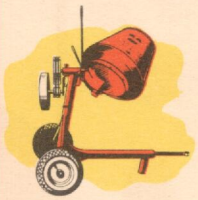
1½ C. Ft. MIXER
Barrow Type
Hand Operated

1¾ C. Ft. MIXER
Stand Type
Hand or Power Operated

2 C. Ft. MIXER
Trailer Type
Power Operated

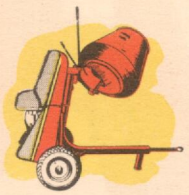
3½ C. Ft. MIXER
Trailer Type
Power Operated

..and you can buy it lik THIS by asking for TH



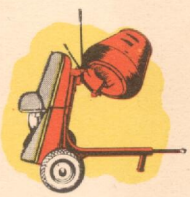
Mixer only with "V" belts & pulleys for inbuilt gear reduction! Mounted on 8" pneumatic wheels!

CATALO NUMB 190



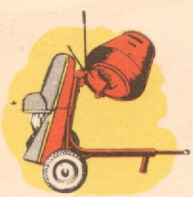
Mixer supplied with mounting for engine . . . including engine fitting, cover, "V" belt and pulley!

CATALO NUMB 19 an 18



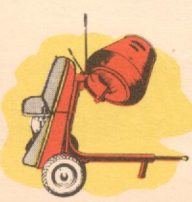
Mixer supplied with mounting for motor . . . including motor fitting, cover, "V" belt and pulley!

CATALO NUMB 19 an 18



Mixer complete with engine mounting & popular, 1½ HP., air cooled, four stroke petrol engine!

CATALO NUMB 19 18 an 18



Mixer complete with motor mounting & ½HP., single phase, 240 V. AC. electric motor!

CATALO NUMB 19 18 an 18

AVAILABLE FROM

LIGHTBURN & CO. LIMITED

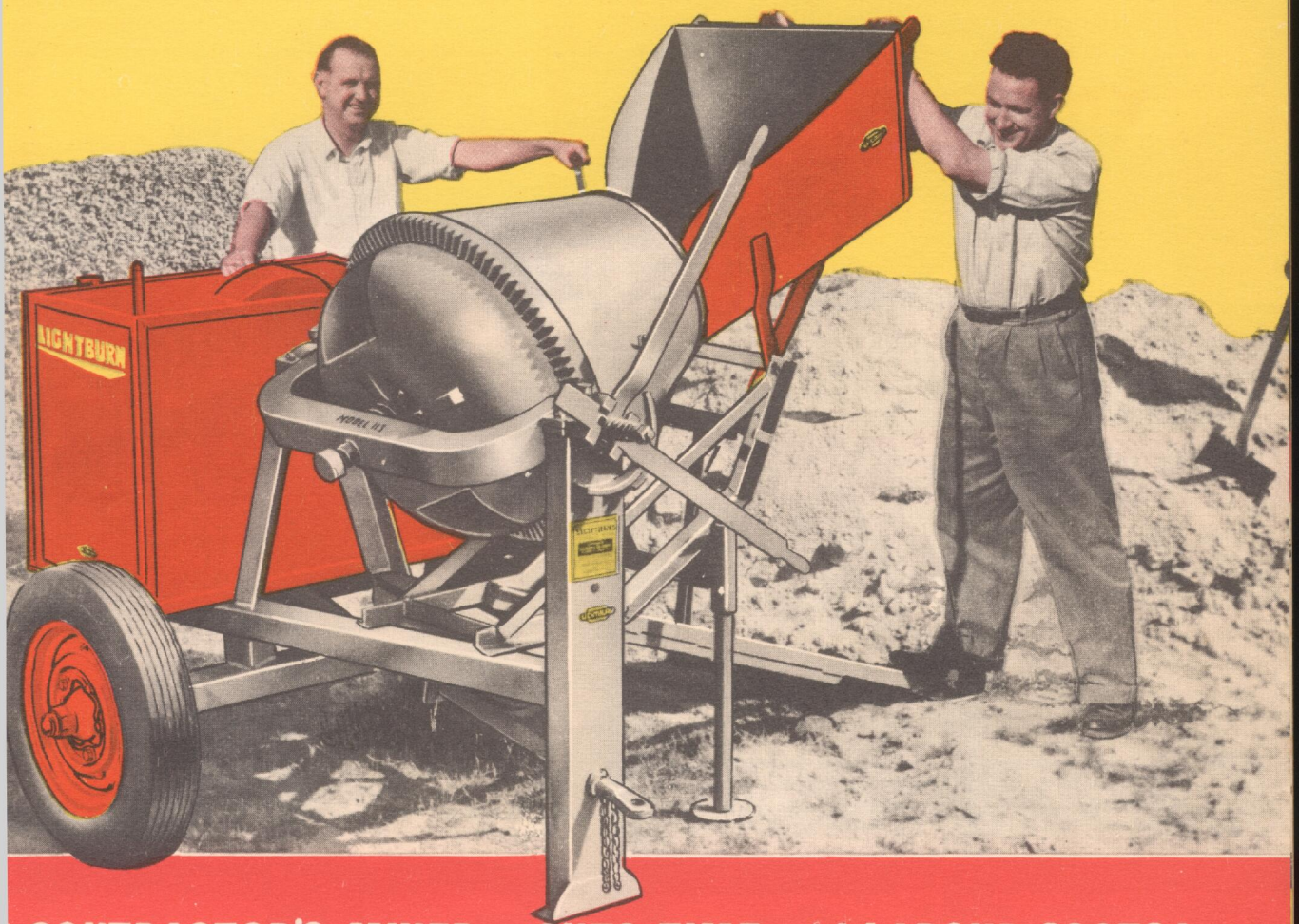
The Concrete Mixer People of Australia!

CNR. GREY & PEEL STS., STH. BRISBANE. 4.1361 | 132 STANMORE ROAD, STANMORE. N.S.W. 56.6351 | 404 ELIZABETH STREET, MELBOURNE. 34.4618 | MORPHETT ROAD, CAMDEN. S.A. 9.4193 | 396 MURRAY STREET, PERTH. 23.1351

LIGHTBURN 3½ c.ft.

Heavy Duty
CONCRETE MIXER

The most popular mixer of its type in Australia ! It mixes quickly and efficiently . . saves time and eliminates hard work . . is easy and comfortable to operate . . is strong, rigid . . will stand up to a lifetime of tough useage with minimum wear . . is mobile . . and built for safe, speedy towing behind truck, utility or car !



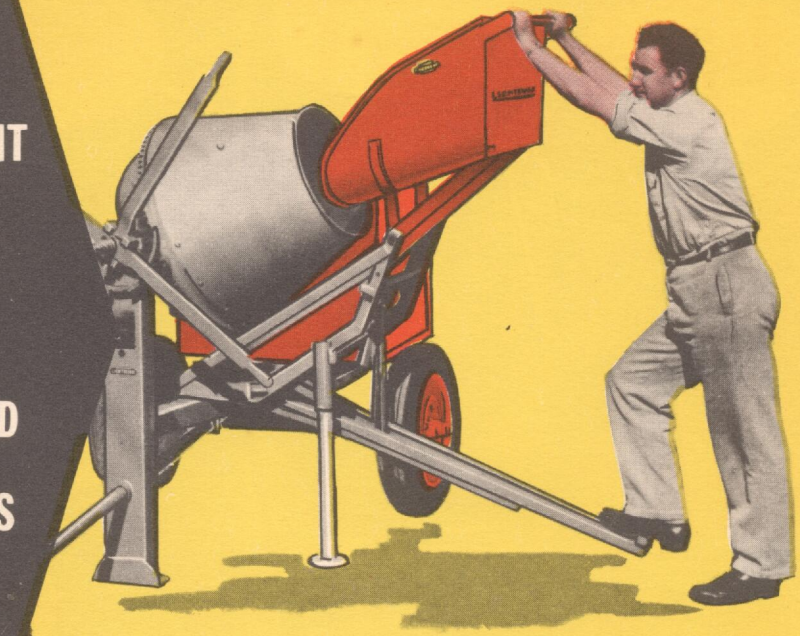
CONTRACTOR'S MIXER...CUTS TIME and LABOUR COSTS!

why they're specified as standard equipment ernment Departments - the Armed Services - Councils - and leading contractors ! You'll m working - and cutting costs - on thousands ding and construction jobs Australia wide !

It's economical to run too - one gallon of petrol gives between 8 and 9 hours continual running ! On average concreting work, this mixer handles a half bag of cement at each batch - has a rated capacity for 5 c. ft. of dry aggregate - 3½ c. ft. wet mix !

Look for this Emblem ANOTHER LIGHTBURN PRODUCT *it's more than a name ... it's a guarantee*

LOADER ATTACHMENT AVAILABLE FOR CONTROLLED CONTINUOUS MIXING!



This loader is specially built as optional equipment for a **LIGHTBURN** 3½ c. ft. Mixer!

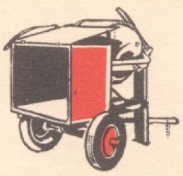
It enables the aggregate proportions to be accurately gauged and satisfy the requirements of supervising architects and inspectors . . gives continuous mixing by filling the hopper with one batch of aggregate as another batch is being mixed!

The operator just stands on the pedal to discharge the batch from the hopper into the mixing bowl!

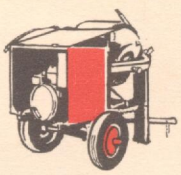
The loader attachment is bolted to the mixer frame . . . the hopper and pedal can be quickly and easily secured for towing!

You can buy it like THIS

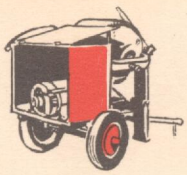
By asking for THIS



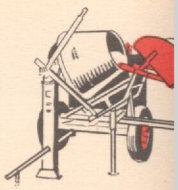
Mixer only, mounted on pneumatic tyres . . . less engine or motor!
CAT. No. 155.



Mixer complete with 2 HP petrol engine, mounted on pneumatic tyres!
CAT. No. 113.



Mixer complete with 1 HP electric motor, mounted on pneumatic tyres!
CAT. No. 161 or 162.



Mixer as prev described but with loader a ment!
ADD CAT. No

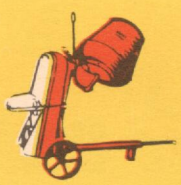
LOOK *at these* OTHER **LIGHTBURN** MODELS *you can* CHOOSE!

1 C. Ft. MIXER
Barrow Type
Hand Operated

1¼ C. Ft. MIXER
Stand Type
Hand Operated

1½ C. Ft. MIXER
Barrow Type
Hand Operated

1¾ C. Ft. MIXER
Stand Type
Hand or Power Operated



2 C. Ft. MIXER
Trailer Type
Power Operated

3 C. Ft. M
Trailer T
Power Ope

The most comprehensive range of mixers available in Australia—3 different types, 7 different models and 28 different combinations to choose from!

AVAILABLE FROM

LIGHTBURN & CO. LIMITED

The Concrete Mixer People of Australia!

CNR. GREY & PEEL STS., STH. BRISBANE 4 1361
132 STANMORE ROAD, STANMORE, N.S.W. 56 6351
404 ELIZABETH STREET, MELBOURNE 34 4618
MORPHETT ROAD, CAMDEN S.A. 9 4193
396 MURRAY STREET, PERTH 23 1351